ISSN 0253-4924

FOOD TECHNOLOGY Abstracts

Vol. 27 No. 6 June 1992

Central Food Technological Research Institute, Mysore
National Information System for Science and Technology
Department of Scientific and Industrial Research, New Delhi.

NATIONAL INFORMATION CENTRE FOR FOOD SCIENCE AND TECHNOLOGY

CFTRI, MYSORE - 570 013

The National Information Centre for Food Science and Technology (NICFOS), is a discipline oriented information service in Food Science, Technology and Nutrition. Set up in October 1977 at the Central Food Technological Research Institute (CFTRI), Mysore, it is one of the Sectoral Information Centres under the NISSAT of the Govt. of India, Dept. of Scientific and industrial Research.

NICFOS's services are generated by a band of professional specialists and backed up by reprographic, micrographic, printing and computer facility. Its services include publication of R & D and industry oriented current awarness services, answering technical inquries, reprography and training.

NICFOS BASE

The well-equipped Library of CFTRI with its collection going back to 1950 function as a clearing house for information on all aspects of food area. With its large collection of books, monographs, conference proceedings, bound volumes of periodicals, standards, patents, reports, theses, microforms and 600 current periodicals it can provide you with the latest information on any subject area of food. The library also serves as a training centre in different aspects of information handling and use besides guiding in setting up of new libraries in the area of food science and technology.

PHOTOCOPY (XEROX) OF PUBLISHED SCIENTIFIC/TECHNICAL ARTICLES

The National Information Centre for Food Science and Technology (NICFOS) at the Central Food Technological Research Institute, Mysore, has got a good collection of scientific and other periodicals collected over the years in the area of Biological Sciences. If any article is needed for reference work, we will supply one copy from our wealth of collections. The cost of providing the copies is Rs.2/- per page (minimum charge Rs.10.00). Please take advantage of this facility to overcome your problem in getting original articles.

All correspondences regarding these services should be addressed to:

The Area Co-ordinator

FOSTIS, CFTRI,

Mysore 570 013,

Karnataka, India.

FOOD TECHNOLOGY ABSTRACTS

Vol. 27 No. 6
June 1992

National Information Centre For Food Science And Technology
Central Food Technological Research Institute,
Mysore - 570 013, India

Compiled and Edited by

B. Vasu

C. S. Anita

Geetha Seetharam

Abstractors to FTA

AS	Author's Summary
BV	B. Vasu
CSA	C. S. Anita
GS	Geetha Seetharam
KAR	K. A. Ranganath
SD	S. Dhanaraj
SRA	S. R. Ananthnarayan
VKR	V. Krishnaswamy Rao

Computerisation and Database Creation

P. Manilal

C. S. Anita

B. Vasu

S. R. Ananthnarayan

Annual Subscription : Rs.250.00. US $ 85.00. Single Copy : Rs.25.00

CONTENTS

ABBREVIATIONS

A	ampere
AAS	atomic absorption Spectrometry
abstr.	abstract
ad lib.	ad libitum
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
BOD	biological oxygen demand
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm^2, cm^3]
cal	calorie
cd	candela
Ci	curie
CMC	carboxymethyl cellulose
COD	chemical oxygen demand
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter, Deutsche Mark
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetra acetic acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10^{-15}, as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram
GC	gas chromatography
gn	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycle/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcal, kg]
K	Kelvin
l	litre
lb	pound
lb	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-equiv	milli-equivalent
m	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt	.molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10^{-9}, as in nm]
N	Newton [kg m/s^2]
N.	North, Northern, normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10^{-12}, as in pCi]
P	poise
P	probability
Pa	Pascal [N/m^2]
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride
qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	south, Southern, etc.
s.d.	standard deviation
SDS	sodium dedecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp.,spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
w	watt
W.	West,Western,etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
µ	micro-[as in g, m]
%:	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

Chemical symbols are used for all elements.

ABBREVIATIONS FOR LANGUAGES

Language of text

Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
spanish	Es
swedish	Sv

GENERAL

1100

Roser (B). **Trehalose, a new approach to premium dried foods.** *Trends in Food Science and Technology* 2(7): 1991: 166-169

The simple but unusual sugar trehalose has the remarkable ability to completely protect cryptobiotic plants and animals from damage caused by desiccation, can be applied on an industrial scale to the drying of foods. Although the use of trehalose is presently restricted to the drying of foods that are liquid or pureed, current research indicates that its use can be successfully extended to sliced foods, with only minor modifications of technique. This bland, non-toxic sugar form a glass during drying that entraps volatile food aromatics: these are released when the dried product is reconstituted with water. Aspects covered in this review are: trehalose and cryptobiosis, trehalose-dried foods, preservation of food volatiles, mechanism of action (hydrogen bonding, glass formation and chemical stability) and nutritional characteristics. 21 references. BV

FOOD PROCESSING

Nil

FOOD PACKAGING

1101

Robertson (GL). **Predicting the shelf-life of packaged foods.** *ASEAN Food Journal* 6(2): 1991: 43-51

This article reviews aspects on factors controlling shelf-life (product characteristics, distribution environment, package properties), and accelerated shelf-life testing (basic principles, ASLT procedures and problems in the use of ASLT conditions). 21 references. SRA

Packaging materials

1102

Letinski (J) and Halek (GW). **Interactions of citrus flavour compounds with polypropylene films of varying crystallinities.** *Journal of Food Science* 57(2): 1992: 481-484

Equilibrium sorption levels at 23 C were determined individually for two citrus flavour components (d-limonene and l-carvone) into ground and unground polypropylene films of different crystallinities. Sorption levels at equilibrium were also determined for a mixture of the two flavour compounds. Aqueous solutions of the flavour compounds (200 p.p.m. carvone and 100 p.p.m. limonene) were employed. Concn. of flavours remaining in solution before and after exposure were measured by HPLC. Results indicated flavour compound polarity, polymer crystallinity and the presence of other flavour compounds in a mixture influenced sorption behaviour. AS

1103

Nielsen (TJ), Jagerstad (IM), Oste (RE) and Wesslen (BO). **Comparitive absorption of low molecular aroma compounds into commonly used food packaging polymer films.** *Journal of Food Science* 57(2): 1992: 490-492

Five polymer films commonly used in food packages were stored in an aqueous solution of 10 apple aroma compounds. Substances absorbed by the polymers were determined by a supercritical fluid extraction/GC method. Polypropylene absorbed most aromas, more than 2 x amounts absorbed by low density polyethylene. Polyamide and polyester absorbed very small amounts of the aromas. Esters and aldehydes were absorbed much more than alcohols. Mol. size also affected absorption, larger molecules being absorbed to a greater extent than smaller ones. For most materials the absorption equilibrium was reached within a wk. AS

FOOD ENGINEERING AND EQUIPMENT

1104

Caro (RH) and Morgan (WE). **Trends in process control and instrumentation.** *Food Technology* 45(7): 1991: 62, 64-66

This article attempts to explore some recent technological advances in instrumentation and control with potential applications in food processing. Factors hindering implementation, progress in other industries, developments in control technology, driving forces for improvements, trends in instrumentation and control, keys to the future and the improved food process control are dealt. CSA

1105

Hartman (TG), Overton (SV), Manura (JJ), Baker (CW) and Manos (JN). **Short path thermal desorption. Food science applications.** *Food Technology* 45(7): 1991: 104-105

The functions of the short path thermal desorption system which provides analysis of volatile and semivolatile components in foods and packaging materials have been discussed in this article. The applications of this technique in food analysis and other areas are dealt. CSA

1106

Matthiesen (A), McIntyre (F) and Ibar (JP). **Thermal analysis spectrometer characterizes food properties.** *Food Technology* 45(7): 1991: 106-107

The experiments performed using a thermally stimulated current/relaxation map analysis (TSC/RMA) spectrometer designed for ease of use, flexibility of sample handling and high sensitivity has been discussed. The current applications of TSC/RMA spectrometer is that it provides improved sensitivity for many product developement and quality control applications. CSA

1107

Djelveh (G), Malgorn (Y) and Gros (JB). **Component flows and interactions in agar gels predicted by linear irreversible thermodynamics.** *Journal of Food Science* 57(2): 1992: 449-453, 489

Equations derived from the linear irreversible thermodynamics showed direct relationships between flow, pressure and chemical potential gradients. To predict flows, three coeff. (hydraulic permeability, solute permeability, and reflection coeff.) were introduced into the equations and measured experimentally for counter-current transfer of water and salt in agar gels. The reflection coeff. was less than 0.0003 indicating that the gel behaved as a non-selective membrane. To analyse the interactions, three interaction coeff., for solute and water, solute and polymer network and water and polymer network were used, and expressed as a function of the former coeff. Results showed that only salt and water interactions controlled the rate of transfer. AS

1108

Sakai (N) and Hayakawa (K-I). **Two dimensional simultaneous heat and moisture transfer in composite food.** *Journal of Food Science* 57(2): 1992: 475-480

A computerized method was developed to predict two dimensional, simultaneous heat and moisture transfer in a composite food with chemical reactions, based on the use of the chemical potential as the mass transfer potential. Thermodynamically interactive heat and mass fluxes were included in the mathematical model. Composite cylindrical samples in 3 layers prepared from a high amylose starch granule hydrate and a mixture of the same dhydrate and sucrose were dried in a forced air dryer to experimentally verify values predicted by the computerized method. The central temp. and av. moisture contents of the samples determined experimentally, agreed well with those predicted theoretically. AS

1109

Campbell (S) and Ramaswamy (HS). **Heating rate, lethality and cold spot location in air-entrapped retort pouches during over-pressure processing.** *Journal of Food Science* 57(2): 1992: 485-489

The effects of entrapped air on the heating rate, lethality and cold spot in bricks packaged in retort pouches were determined using silicone rubber bricks (10 x 14.5 x 2 cm), with 5 thermocouples positioned from the geometric center-point to near the top surface. The packaged bricks were processed in steam/air media at two temp. (121.1 C and 115.6 C) and two levels of superimposed air over-pressure (corresponding to 65% and 75% steam). With the exception of the highest level of over-pressure, (121.1 C, 65% steam content), entrapped air volumes > 20 mL reduced heating rates and lethality, and shifted the cold spot from the geometric center. At 60 mL of entrapped air the point of least lethality was near the brick surface. AS

1110

Bakhit (RM) and Schmidt (SJ). **Sorption behaviour of mechanically mixed and freeze-dried NaCl/casein mixtures.** *Journal of Food Science* 57(2): 1992: 493-496, 502

Adsorption isotherms of mechanically mixed and freeze-dried mixtures of NaCl/casein at solute percentages of 1, 5, 10, 15 and 20 (wet basis) were obtained over the a_w range 0.23 - 0.927 at 20 C. Experimental isotherm values were compared to those calculated by a mass balance equation. The mechanically mixed samples sorbed additively as predicted by the mass balance equation below 0.755 a_w, whereas the freeze-dried mixtures sorbed more water than predicted (positive interaction) below 0.755 a_w. Both types of mixtures sorbed less water than predicted by the mass balance equation (negative interaction above the saturation a_w of the NaCl, 0.755. AS

1111

Yang (BB) and Swartzel (KR). **Particle residence time distributions in two-phase flow in straight round conduit.** *Journal of Food Science* 57(2): 1992: 497-502

Residence times were studied for single particles (polystyrene spheres 19.1 mm diam.) in the straight

portion of the holding section of a continuous flow system. Particle residence times were all less than the mean residence time of fluid; their ranges were within particle-to-fluid residence time ratios of 0.8 to 1.0. The velocities of the fastest moving particles were all about 1.25 times the mean fluid velocity in the turbulent flow regime. Particle density was important in the flow patterns of two-phase flow. The effect of particle-to-fluid density ratios on the particle residence time followed a quadratic function where particles with density ratio of 1.01 had the least residence time. AS

1112

Onwulata (CI), Mulvaney (SJ), Hsieh (F) and Heymann (H). **Step changes in screw speed affect extrusion temperature and pressure and extrudate characteristics.** *Journal of Food Science* 57(2): 1992; 512-515

A first order lag with time delay was used to model dynamic responses of product temp., torque, and mass pressure to step changes in screw speed. Transportation lag was evident in the mass temp. at the die, while the time constants generally decreased with increased magnitude to the step input. Dynamic responses indicated a more stable response to larger magnitude of step inputs. Product attributes and process variables were shown to be a function of the magnitude of the step input when final screw speed set points were identical. AS

1113

Wicker (L). **Selective extraction of thermostable pectinesterase.** *Journal of Food Science* 57(2): 1992; 534-535

Thermostable pectinesterase was estimated to represent 98% of total activity extracted from Marsh grapefruit pulp by 1M NaCl without pH adjustment or 17% when extracted with 1M NaCl, 0.25M Tris-Cl, pH 8.0. Total units of pectinesterase solubilized were less in 1M NaCl at endogenous pH values than at pH 8.0, but total thermostable pectinesterase units remained constant. No conversion of thermostable to heat sensitive isoenzymes was observed. Preparative isoelectric focusing indicated that most activity focused at alkaline pH values. The constant specific activity suggested co-migration of basic proteins. AS

1114

Jackson (LS) and Lee (K). **Microencapsulation and the food industry.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991; 289-297

This article reviews properties of microcapsules, uses for microencapsulation (acids, lipids, enzymes, microorganisms, flavours, artificial sweeteners, gases, vitamins and minerals), microencapsulation techniques (spray drying, spray chilling and spray cooling, extrusion, air suspension coating, mutli-orifice centrifugal extrusion, coacervation/phase separation, liposome entrapment, inclusion complexation, co-crystallization and interfacial polymerization). 74 references. BV

1115

Schmidt (B) and Dirksen (J). **Recent advances in conveyor lubrication.** *Technical Quarterly, Master Brewers Association of America* 28(1): 1991; 1-3

This paper discusses the changing needs of the brewer, and how advances in conveyor lubricant formulation and application technology. Covers improved lubrication for high-speed conveyors, elimination of soil on conveyor, control of microorganisms, foam control, prevention of nozzle plugging, improved storage and handling, cost control and effluent control. BV

Equipments

1116

Yazbak (G). **Fiberoptic sensors solve measurement problems.** *Food Technology* 45(7): 1991; 76-78

The working of miniature fiberoptic silicon sensors which has resulted in the development of a new measurement technology for the food industry is discussed. The new technology can be used to measure temp., pressure and refractive index which results in superior product quality and lower operating costs. CSA

1117

Jackman (M). **In-line viscometers help achieve perfect products.** *Food Technology* 45(7): 1991; 90-91, 96

This article presents an overview of the rheology of foods, the types of in-line viscometers (coaxial cylinder, pressure drop, vibrating rod) that are available and gives several practical examples of their applications. CSA

1118

Anon. **Instruments for measuring viscosity and flow.** *Food Technology* 45(7): 1991; 92-96

Viscometers and rheometers suited for laboratory or in-line use such as portable viscometer, programmable rheometer, in-line viscosity

transmitter, process viscometer, direct-reading viscometers, rheological properties, viscosity-measurement systems, viscoelasticity analyzer, information, fluids analyzer, dual detector and in-line viscometer are featured in this article. CSA

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

1119

Ukhun (ME) and Dibie (EN). **The ascorbic acid content of selected marketed foods and influence of water activity (a_w) during storage.** *Food Chemistry* 41(3): 1991: 277-283

Ascorbic acid levels were 0 - 184 mg/100g in foods, 184.6 plus or minus 20.7 in whole guava fruit, 138.4 - 155.2 in fresh palm wine, 86.8 plus or minus 10.5 in whole red pepper, 70.3 plus or minus 92.6 in commercial palm wine, 44.4 plus or minus 4.2 in cashew apple juice and 42.3 plus or minus 4.6 in ripe pawpaw. Losses between 12 - 83% of ascorbic acid after 4 and 8 wks of storage of garri and cassava were noticed. Increase a_w, resulted in increasing storage losses of vitamins. Generally most of the foods were a good source of ascorbic acid. SD

1120

Anjan Reddy (K) and Marth (EH). **Reducing the sodium content of foods: A review.** *Journal of Food Protection* 54(2): 1991: 138-150

This review article discusses the role of salt in some foods, role of sodium salts other than sodium chloride in foods, physiological role of dietary sodium chloride, sodium and hypertension, salt substitutes and reduction of sodium in dairy products. 168 references. BV

1121

Chauhan (SA), Bhatt (AM), Bhatt (MP) and Majeethia (KM). **Stability of iodised salt with respect to iodine content.** *Research and Industry, India* 37(1): 1992: 38-41

Iodised salt was either stored in packed polythene (HDPE) bags for about 10 months or kept in open heaps. Potassium iodate is found to be stable as it is not lost even after 300 days storage in open or packaged condition. Iodised salt when heated (300 - 500 C/h^3) or boiled, lost only 4 to 11% of iodine which is negligible. GS

Chemistry (Analytical)

1122

Zapata (S) and Dufour (J-P). **Ascorbic, dehydroascorbic and isoascorbic acid simultaneous determinations by reverse phase ion interaction HPLC.** *Journal of Food Science* 57(2): 1992: 506-511

Detection was by UV absorbance (after pre-column derivatization of dehydroascorbic acid with 1,2-phenylenediamine). When absent, isoascobic acid could be used as internal standard. Isocratic separation was accomplished in 11 min using the eluent, methanol-water (5:95, v/v) containing potassium dihydrogen phosphate (50 mM) and the counter ion hexadecyltrimethylammonium bromide (5 mM). Sample preparation steps using Sep-pak C18 cartridge were minimal. Ten p.p.m. could be detected for each compound with good reproducibility (c.v. < 2%). The method was used to determine vitamin C content in selected foods and beverages. AS

1123

Barge (MT), Destefanis (G), Toscano (GP) and Brugiapaglia (A). **Two reading techniques of the filter paper press method for measuring meat water-holding capacity.** *Meat Science* 29(2): 1991: 183-189

1124

Sen (A), Schieberle (P) and Grosch (W). **Quantitative determination of 2,5-dimethyl-4-hydroxy 3(2H)-furanone and its methyl ether using a stable isotope dilution assay.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 364-369

A stable isotope dilution assay has been developed for the quantitative detn. of 2,5-dimethyl-4-hydroxy-3(2H)-furanone (DHF) and its methyl ether in fresh and processed fruits. Application of the method to strawberries (fresh fruits, juice, jam, candies), pineapples (juice, jam) and blackberries has indicated that both compounds can be determined with a high degree of sensitivity and accuracy. Analysis of a strawberry suspension treated with β-glucosidase at pH 6.8 showed a 3.5-fold increase of the DHF level. AS

FOOD MICROBIOLOGY AND HYGIENE

1125

Samarajeewa (U), Wei (CI), Huang (TS) and Marshall (MR). **Application of immunoassay in the food industry.** *CRC Critical Reviews in Food Science and Nutrition* 29(6): 1991: 403-434

This review covers immunoassay techniques and application in the food industry for detecting the naturally occuring food constituents (flavour constituents, undesirable compounds occuring naturally in foods, nutritionally important constituents), food production and processing, (plant growth substances, estimation of food constituents that provide processing characteristics, spoilage of foods and food crops, food processing), food safety (pathogenic microorganisms and their toxins, pesticides, anabolic agents, therapeutic agents, adulterants, immunodiagnostic kits and future prospects). 377 references. SRA

Bacteria

Lactobacillus

1126

Wolf (G), Strahl (A), Meisel (J) and Hammes (WP). **Heme-dependent catalase activity of lactobacilli.** *International Journal of Food Microbiology* 12(2/3): 1991: 133-140

The heme-dependent catalase in *Lactobacillus pentosus, L. sake, L. delbrueckii* and *Enterococcus faecalis* was studied. The catalase was formed by cells grown aerobically in the presence of hematin or for lactobacilli when grown without added hematin, after incubation of buffered cells in the presence of hematin. The kinetics of the production of catalase revealed max. activity for *L. pentosus* and *E. faecalis* at late stationary and late logarithmic growth phase, resp. The physiological role of catalase was studied with *L. sake*. The presence of hematin allows higher growth yields, since it protects the cells against hydrogen peroxide formed endogenously up to concn. of 4.6 mmol/l. AS

Listeria

1127

Siragusa (GR) and Nielsen (JW). **A modified microtiter plate method for biochemical characterisation of *Listeria* spp.** *Journal of Food Protection* 54(2): 1991: 121-123, 130

A microtiter plate format previously reported for the biochemical characterisation of microorganisms was modified by adding agar to all of the different test media instead of using a combination of liquid and solid media. This modification, termed the Modified Microtiter Plate procedure (MMP), offered the same advantages of the original method (labor saving, inexpensive and custom designed for special needs) as well as having the added advantages of longer term storage prior to use and ease of handling. In this study, 60 bacterial isolates (both *Listeria* suspects and known *Listeria* cultures) were biotyped using the MMP protocol and compared to results obtained using the classical tube-based US-FDA recommended protocol as the standard identification method and the BBL-Minitek system. AS

Pseudomonas

1128

Harris (PL) and Cuppett (SL). **Effect of selected antioxidant on the activity of a mixture of crude *Pseudomonas* lipases.** *Journal of Food Protection* 54(2): 1991: 133-135

Commercially acceptable concn. (0.02%) of BHT, BHA, TBHQ, Tenox 4, and Tenox 8 were evaluated for their effect on the lipolytic activity of mixed *Pseudomonas* crude lipases (MCLs). MCLs were prepared from lipases produced by raw milk isolates of *Pseudomonas fluorescens, P. cepacia* and *P. putida*. GRAS antioxidants, 1-ascorbyl 6-palmitate (AP) and d-α-tocopherol (AT), at 0.5, 1.0 and 2.0% concn., were also evaluated for their effect on lipase activity. Antioxidants and enzyme preparations were incubated for 30 min at 25 or 40 C. At 25 C, all antioxidants tested inhibited lipase activity to some extent. At 2% concn., AP completely (100%) inhibited lipolytic activity, and AT inhibited lipolytic activity by 89%. At 40 C, the effectiveness of AP and AT as lipolytic inhibitors decreased, and the low concn. of BHT, BHA, TBHQ, Tenox 4 and Tenox 8 stimulated lipolytic activity. AS

Pseudomonas fragi

1129

Harmayani (E), Sofos (JN) and Schmidt (GR). **Growth and aminopeptidase activity of *Pseudomonas fragi* in presence of phosphates.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 350-354

Sodium hexametaphosphate (0.3 and 0.5%) virtually eliminated the growth of *Ps. fragi* and repressed aminopeptidase activity during 5 days at 5 C in trypticase soybroth. The effects of phosphates were in the following order: sodium

hexametaphosphate > sodium acid pyrophosphate > sodium tripolyphosphate and tetrasodium pyrophosphate (P > 0.05). BV

Fungi

1130

Wheeler (KA), Hurdman (BF) and Pitt (JI). **Influence of pH on the growth of some toxigenic species of *Aspergillus*, *Pencillium* and *Fusarium*.** *International Journal of Food Microbiology* 12(2/3): 1991: 141-150

The effect of pH on the growth rates of 61 isolates belonging to 13 important toxigenic fungi are reported here: four species each of *Aspergillus* and *Fusarium*, and five of *Penicillium*, over the pH range 2 to 11 at 25, 30 and 37 C. Nearly all species studied were able to grow over the entire range examined on a lab. agar medium. However, in general *Aspergillus* species were more tolerant of alkaline pH while *Penicillium* species appeared to be more tolerant of acidic pH. AS

Aspergillus

1131

Reynolds (G) and Pestka (JJ). **Enzyme-linked immunosorbent assay of versicolorin A and related aflatoxin biosynthetic precursors.** *Journal of Food Protection* 54(2): 1991: 105-108

An immunochemical approach is described for the detection of versicolorin (VA) and other aflatoxin precursors in *Apsergillus parasiticus* cultures. VA was purified from *A. parasiticus* ATCC 36537 cultures by semipreparative HPLC and confirmed by mass spectrometry and ultraviolet (UV) absorption. To be rendered immunogenic, VA was converted to a hemiacetal and conjugated to bovine serum albumin (BSA) by reductive alkylation. Rabbit polyclonal antiserum prepared against the VA hemiacetal-BSA conjugate was employed in a competitive ELISA using VA hemiacetal-horseradish peroxidase conjugate as the marker ligand. Based on the amount of VA analogue required to inhibit binding by 50% in competitive ELISA, cross-reactivity relative to VA for VA hemiacetal, averufanin, averantin, norsolorinic acid, averufin, sterigmatocystin, and aflatoxin B_1 were 106, 85, 7, 6, 2 and < 1% respectively. The ELISA was used to monitor ennanced production of VA equivalents by *A. parasiticus* ATCC 36537 in a modified culture procedure. The VA antibody should be extremely useful in the biochemical and genetic investigation of aflatoxin biosynthesis. AS

Aspergillus flavus

1132

Criseo (G), Urzi (C), Pernice (I) and Medici (MA). **Growth and aflatoxin production by *Aspergillus flavus* link under cycling temperatures.** *Italian Journal of Food Science* 2(1): 1990: 43-51

The effects of cycling temp. of mycelial growth and aflatoxin production by *Aspergillus flavus* Link were studied using 3 cycles characteristic of the climate in southern Italy: they were compared to the control, constant 28 C. *A. flavus* development on yeast extract sucrose medium measured as mycelial dry wt. was higher at constant 28 C within the first 6 days, whereas greater growth was observed from the 10th to 18th day at the three cycling temp. Growth on moistened maize kernels was directly related to thermal input within the first wk of incubation. After the first wk, growth behaved differently according to the utilized temp. *A. flavus* produced aflatoxins under all four temp. conditions. Summer and spring cycles increased aflatoxin production while the Autumnal cycle did not. Compared with the constant temp. of 28 C the time required for the biosynthesis of toxins by the mold was inversely related to the total amount of heat input. AS

Mushrooms

1133

DaDamio (PA) and Thompson (DB). **Mushroom (*Agaricus bisporus*), its polyphenoloxidase, and polyphenolics affect *in vitro* iron availability.** *Journal of Food Science* 57(2): 1992: 458-461, 511

In vitro Fe availability (IA) from egg white meals was 14 - 17% of total meal Fe. When mushroom (*Agaricus bisporus*) was added to egg white meals, IA decreased. The initially low IA from whey protein conc. meals (< 1% of meal Fe) was enhanced by mushroom. Sodium benzoate or sodium bisulphite added to egg white/mushroom meals increased IA. Addition of polyphenoloxidase (PPO) and gallic acid to egg white meals decreased IA: however, gallic acid alone increased IA. Blanching mushrooms eliminated PPO activity and increased IA of egg white/mushroom meals, but it was still less than for egg white meals. Sodium bisulphite added to blanched mushroom/egg white meals increased IA above that for egg white meals. Results are consistent with the interpretation that enzymatic browning can decrease IA. AS

1134

Vijaya Sethi, Jai Bhagwan, Neeta Behal and Sashi Lal. **Low-cost technology for preserving mushrooms (*Agaricus bisporus*).** *Indian Food Packer* 45(6): 1991: 22-26

Blanched and unblanched mushrooms (*Agaricus bisporus*) were preserved for 1 yr using salt (2%), sugar (2%), citric acid (0.3%), potassium meta bisulphate (0.1%) and ascorbic acid (1.0%) with steeping preservation technique. Blanching helped in the retention of colour, flavour and texture up to 6 months while unblanched mushrooms spoiled within 3 months. This preservation technique is economical and simple. GS

Yeasts

1135

Deiana (P), Cecchi (L), Lodi (R), Berardi (E), Farris (GA), Fatichenti (F). **Some aspects of diacetyl and acetoin production by *Debaryomyces hansenii*.** *Italian Journal of Food Science* 2(1): 1990: 35-42

Both acetoin and diacetyl were produced by *Debaryomyces hansenii* in synthetic media using lactic acid with glucose and glucose alone as sole carbon sources. The production of these metabolites was confirmed by the radiotracer (^{14}C) technique. Quantitative detn. were subjected to factorial analysis of variance. Diacetyl production was significantly influenced by strain and substrate. A higher value was found for each strain with the glucose substrate. Strain SGSI1 and glucose gave the highest production, while strain F3512 and lactate gave the lowest. Acetoin production was affected by strain, substrate and time of incubation. The biochemical pathway of production seemed to be the formation of acetoin through the decarboxylation of acetolactate and the subsequent oxidation of acetoin to diacetyl. AS

1136

Gardini (F), Castellari (L) and Guerzoni (ME). **Suitability of three instrumental methods for evaluating yeast cell viability in enology.** *Italian Journal of Food Science* 2(2): 1990: 103-111

Three unconventional methodologies for the microbiological control of wine and winery environments were compared to assess their suitability for routine control in enology. The methods examined were the adenosine triphosphate (ATP) assay technique, the direct epifluorescence filter technique and the GC detn. of metabolic CO_2. The advantages and disadvantages of these methods are discussed in relation to the plate counting procedure, which was used as a reference. AS

Hygiene

Listeria monocytogenes

1137

Pearson (LJ) and Marth (EH). ***Listeria monocytogenes* - threat to a safe food supply: A review.** *Journal of Dairy Science* 73(4): 1990: 912-928

Aspects reviewed in this article include: general characteristics (morphology, growth requirements, biochemical properties and serotyping) of Listeria, listeriosis (zoonosis, transmission, virulence and disease manifestation in humans), environmental resistance (psychrotrophic properties and thermal resistance), evidence for a foodborne threat (outbreaks of foodborne listeriosis, occurrence in dairy products and other foods, behaviour during food processing and effect of lactic starter culture) isolation and recovery methods (selective or differential plating media, enrichment procedure, monoclonal antibody-enzyme immunoassay deoxyribonucleic acid hybridization, immunofluorescence and flow cytometry), maintanence of safe food supply (inactivation of pathogen in food, effectiveness of santitation methods and food plant safety precautions). 112 references. BV

BIOTECHNOLOGY

1138

Gadgoli (C), Sarang (MS) and Jolly (CI). **Single-cell protein from the peels of *Musa paradisiaca*.** *Research and Industry, India* 37(1): 1992: 18-20

The peels of banana (*Musa paradisiaca*) were used as the medium for cultivating yeast for the production of single-cell protein. The max. protein content of 40.70% w/w and 41.18% (on dry basis) was obtained with *Torula* spp. in static condition and with *Saccharomyces* spp. in shaking conditions respectively. GS

1139

Cantarelli (C). **Biotechnology in the food industry: An overview.** *Italian Journal of Food Science* 2(1): 1990: 9-24

The integrated use of enzymology, microbiology, immunology, genetics and engineering (as biotechnology may be defined), plays a basic role in food processing. Recent findings are reviewed, starting with examples of the integration of genetic improvement of primary agricultural products and their processing as food. A concise forecast of the possibilities offered by new developments in first generation, "soft" biotechnologies and advanced, genetic or "hard" ones is presented. The main topics are: i) improvement of microbial starters; ii) microorganism and enzyme immobilization; iii) availability of "new" enzymes and their application

in replacing chemical processes, even on apolar substrates; iv) production of metabolites as ingredients and improvers; v) biotechnological (enzymatic, immunological) methods for quality control, to estimate main components, to detect contaminants, as well as for quick microbiological tests of high specificity. The role of improvements in the food sector produced by novel biotechnologies is stressed. AS

1140

Herrera (JC) and Romero (AJR). **Biological evaluation of a plantain (*Musa paradisiaca*) leaf protein concentrate.** *Italian Journal of Food Science* 2(2): 1990: 89-96

The possibility of using plantain (*Musa paradisiaca* L.) leaves as an unconventional protein source was evaluated. A leaf protein concentrate (LPC), obtained by extraction with NaOH and subsequent acid precipitation (pH = 4.5) showed the following unacceptable low nutritional parameters: Protein Efficiency Ratio (PER) = -1.1, True Digestibility (TD) = 61 plus or minus 7% and net protein ratio (NPR) = 0.1 plus or minus 0.3. Leaf protein concentrate, obtained by extraction with NaOH in the presence of sodium sulphite, heated at 85 C for 5 min, acid precipitated (pH = 6), and supplemented with DL-methionine (0.6%), showed a much better nutritional value: PER = 1.9, TD = 46 plus or minus 6% and NPR = 3.0 plus or minus 0.1. Methionine supplementation and inhibition of the oxidation of polyphenols make plantain leaves an acceptable protein source for LPC preparation. AS

TISSUE CULTURE

1141

Stafford (A). **The manufacture of food ingredients using plant cell and tissue cultures.** *Trends in Food Science and Technology* 2(5): 1991: 116-122

Plant cell cultures are a potential source of novel food ingredients with desirable flavour properties. Like microbial cultures, they can be rapidly scaled up to provide biomass for extraction and analysis. More than 80 novel compounds have been isolated from 30 different plant cells cultures: these composition include 23 alkaloids, 19 terpenoids, 30 quinones and 11 phenyl prapanoids. Several essential oils like anethole, limonene, geraniol, menthol: flavour compounds like citral, citronellol: pigments like beta-xanthin, bixin, anthocyanin, carotenoids have been derived through plant tissue culture. GS

FOOD ADDITIVES

1142

Mori (H), Iwata (H), Tanaka (T), Morishita (Y), Mori (Y), Kojima (T), Okumura (A). **Carcinogenicity study of cochineal in B6C3F$_1$ mice.** *Food and Chemical Toxicology* 29(9): 1991: 585-588

The carcinogenicity of cochineal, a red colouring used in food and other products, was studied in a 2 yr bioassay in B6C3F$_1$ mice. Groups of 50 - 55 mice of each sex were given 0, 3 or 6% cochineal in the diet for 2 yr. Mice of all groups developed tumors including hepatocellular adenomas or carcinomas, pulmonary adenomas or adenocarcinomas and lymphomas or lymphatic leukaemias, and the incidences of these tumors were not significantly different in treated and control groups. The results indicate that cochineal lacks carcinogenicity in mice and are consistent with those of *in vitro* short-term assays of cochineal and of carminic acid, an active principle of cochineal. AS

1143

Maekawa (A), Matsushima (Y), Onodera (H), Shibutani (M), Yoshida (J), Kodama (Y), Kurokawa (Y), Hayashi (Y). **Long-term toxicity/carcinogenicity study of calcium lactate in F344 rats.** *Food and Chemical Toxicology* 29(9): 1991: 589-594

Calcium lactate administered on long-term basis to groups of 50 male and 50 female rats for 2 yr in drinking-water at levels of 0, 2.5 or 5% showed neither toxic nor carcinogenic activity in F344 rats. BV

CEREALS

1144

Schiweck (H). **Sweeteners and sugar-replacer in cereal based food.** *Getreide-Mehl und Brot* 44(7): 1990: 210-213 (De)

Rice

1145

Murphy (PA), Smith (B), Hauck (C) and O'Connor (K). **Stabilization of vitamin A in a synthetic rice premix.** *Journal of Food Science* 57(2): 1992: 437-439

The thermodynamics of vitamin A (VA) loss, accelerated storage studies conducted at three to four temp. and two a_w and the effect of different formulation ingredients on stability kinetics was

evaluated. VA was stabilized with a combination of tocopherol, ascorbic acid and saturated lipids in the formulation. Washing stability of VA was 100%. Cooking stability was > 80% retention of VA. ΔH^{++} of VA degradation ranged from 4 to 34 Kcal/mol. depending on a_w and formulation. Entropies ranged from 11 to -79 cal/mol-deg. ΔH^{++} was unchanged averaging 29 Kcal/mol. The best t_{12}s for VA were > 1 yr. Successful stabilization of VA has enabled this premix to be used in clinical and pilot field fortification studies in the Philippines. SRA

Brown rice

1146

Champagne (ET) and Hron (RJSr). **Stability of ethanol-extracted brown rice to hydrolytic and oxidative deterioration.** *Journal of Food Science* 57(2): 1992: 433-436

Brown rice kernels extracted with EtOH at 70 C for 60 min were the most stable to lipolytic hydrolysis; free fatty acids (FFA) level in these kernels increased from 1.0 - 1.4% during 6 months of storage at 36 C. At lower extraction temp. and times, kernels were less stable to lipolytic hydrolysis. The higher the temp. of extraction, the more susceptible kernels were to oxidative deterioration during storage; extraction time was not a factor. Kernels extracted with recycled EtOH were no more susceptible to oxidation than those extracted with fresh EtOH. AS

Wheat

1147

Cara (L), Borel (P), Armand (M), Lafont (H), Lesgards (G), Lairon (D). **Milling and processing of wheat and other cereals affect their capacity to inhibit pancreatic lipase *in vitro*.** *Journal of Food Science* 57(2): 1992: 466-469, 484

The inhibition of pancreatic lipase activity by extracts of durum wheat, soft wheat and millet was high, moderate in barley and white sorghum and very low in red sorghum. Milling whole-grain into flours decreased the lipase inhibitory activity in all species. Processing of soft wheat by bread making, popping, flaking, drum-drying and extrusion cooking, or durum wheat by making pasta markedly decreased lipase inhibitory capacity. SRA

MILLETS

Corn

1148

Fields (ML), Tantratian (S) and Baldwin (RE). **Production of bacterial and yeast biomass in ground corn cob and ground corn stalk media.** *Journal of Food Protection* 54(2): 1991: 117-120

1149

Paster (N), Blumenthal-Yonassi (J), Barkai-Golan (R) and Menasherov (M). **Production of zearalenone *in vitro* and in corn grains stored under modified atmospheres.** *International Journal of Food Microbiology* 12(2/3): 1991: 157-166

The production of zearalenone by an isolate of *Fusarium equiseti* was studied in chemically defined medium and in corn grains stored under modified atm. An increase in the concn. of sucrose of xylose on Czapek's medium resulted in increased toxin production, while no toxin was produced when lactose was present in the medium. Methionine (10^{-2} and 10^{-3} M) and cystine (10^{-3} M) added to Czapek's medium inhibited zearalenone production. When amino acids or nitrogen salts were added as a sole nitrogen source, only alanine, tryptophan and NH_4Cl totally inhibited zearalenone production. Zearalenone production was inhibited almost completely in high-moisture corn grains (27%) kept under atm. enriched with high CO_2 levels (60%, 40% or 20%) with either 20% or 5% O_2. However, a lower amount of CO_2 was needed to inhibit fungal development and toxin formation when a reduced O_2 level was applied. AS

1150

Tolaba (MP), Suarez (C) and Viollaz (PE). **Diffusion coefficient estimation for shelled corn.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 303-306

Thinlayer drying curves of shelled corn were determined at 40, 50, 60 and 70 C and 'high' RH, for a moisture range from 21 to 12%, dry basis. Simulation of the experimental drying curves was performed by means of Fick's second law for diffusion out of a sphere, with constant diffusion coeff. An accurate fitting of the experimental data was obtained assuming an equilibrium value given by the desorption isotherm of grain (static equilibrium moisture content). A reasonable agreement was also found between the dynamic equilibrium moisture content (obtained from the drying data) and the static one. A criterion was proposed, based on the monolayer moisture content, where the static equilibrium moisture fits the experimental drying curves. AS

Sweet corn

1151

Zhu (S), Mount (JR) and Collins (JL). **Sugar and soluble solids changes in refrigerated sweet corn (*Zea mays* L).** *Journal of Food Science* 57(2): 1992: 454-457

Three sweet corn (*Zea mays* L) genotypes, one cv. each, were tested for sugar and soluble solids changes at 6 C for 5 days. Genotypes and cvs. were sugary (su), 'Silver Queen'; sugary enhanced (se), 'Incredible' and super sweet (sh 2), 'How Sweet It Is'. Fructose, glucose, sucrose, maltose, total sugars and °Brix were measured. Sucrose predominated. Generally, °Brix, fructose, glucose and sucrose decreased and maltose increased. sh 2 had lowest °Brix and highest sucrose and total sugars, and su had highest °Brix and lowest sucrose and total sugars. su consisted of 3.8% total sugars (DWB); se, 7.2% and sh 2, 10.9%. Overall correlation coeff. between °Brix and total sugars was -0.99. AS

PULSES

Broad beans

1152

Zheng (B-A), Matsumura (Y) and Mori (T). **Molecular forces in thermal association-dissociation and gelation of legumin from broad beans.** *Journal of Food Science* 57(2): 1992: 423-426

Chickpeas

1153

Singal (SK) and Singh (Z). **Studies of plant oils as surface protectants against pulse beetle, *Callosobruchus chinesis* (L.) in chickpea, *Cicer arietinum* L. in India.** *Tropical Pest Management* 36(3): 1990: 314-316

Chickpea seeds infested with *Callosobruchus chinensis* were treated with groundnut, coconut, mustard, sesame, soybean and rapeseed oils at 1.3 and 5 ml/kg levels. Untreated seeds showed significantly more oviposition than treated seeds in all cases. Least oviposition (34.3 eggs) occured on seeds treated with mustard oil at 5 ml/kg, less with coconut oil at 5 ml/kg (46.0 eggs) and 3 ml/kg (47.3 eggs). The min. adult emergence (0.5%) was recorded from seeds treated with mustard oil applied at 5 and 3 ml/kg followed by groundnut (7.3%), soybean (16.7%) and rapeseed (6.2%) oils when applied at 1 ml/kg. Chickpea seeds treated with oils suffered less seed damage (0.5%) than untreated seeds and it did not adversely effect seed germination. CSA

Cowpeas

1154

Lombardi-Boccia (G), Carbonaro (M) and Carnovale (E). **Trypsin and chymotrypsin inhibitors for a wild species and a domestic species of cowpea (*Vigna unguiculata*).** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 370-372

Locust beans

1155

Lopes Da Silva (JA), Goncalves (MP) and Rao (MA). **Rheological properties of high-methoxyl pectin and locust bean gum solutions in steady shear.** *Journal of Food Science* 57(2): 1992: 443-448

The Cross and Carreau flow models described well the shear rate-apparent viscosity data. The coil overlap parameter, c[*n*], correlated well with the zero-shear rate specific viscosities of these mixtures. Experimental values of intrinsic viscosities of the mixtures were in good agreement with the prediction based on an additive model of the individual contributions of the gums. From the results obtained for the mixtures of both polysaccharide sol. at similar viscosity, pH and ionic strength, no significant interactions were detected. Hypotheses for this lack of polymer interaction were developed. Results with such model systems are useful in understanding the relation of compositions to the properties of complex food systems. AS

OILSEEDS AND NUTS

Coconuts

1156

Tongdee (SC), Suwanagul (A) and Neamprem (S). **Postharvest handling of tender coocnut.** *ASEAN Food Journal* 6(2): 1991: 74-75

This paper reports on the rupture force of coconuts of different maturity stages and the use of sodium metabisulphite solution to prevent browning of the trimmed nuts. BV

Groundnuts

1157

Kim (N), Km (YJ) and Nam (YJ). **Characteristics and functional properties of protein isolates from**

various peanut (*Arachis hypogaea* L.) cultivars. *Journal of Food Science* 57(2): 1992: 406-410

Groundnut milk

1158

Lee (C) and Beuchat (LR). **Chemical, physical and sensory characteristics of peanut milk as affected by processing conditions.** *Journal of Food Science* 57(2): 1992: 401-405

Soaking peanuts in 0.1% $NaHCO_3$ before extraction resulted in a higher coloured peanut milk (PM), and homogenization enhanced lightness. Cooking peanuts before grinding reduced total solids and protein contents of PM. Hexanal concn. was greatly reduced by cooking peanuts for 10 min. PM made from peanuts soaked in 0.5% $NaHCO_3$ generally had the lowest panel ratings for green/beany, sulphur, bitter, astringent and cooked peanut flavours and chalky mouthfeel: PM prepared by soaking peanuts in 0.5% $NaHCO_3$, cooking for 10 min and homogenizing the extract at 4000 psi was found satisfactory. SRA

Niger seed

1159

Pawar (VD), Upadhye (VP) and Nimkar (DJ). **Foaming properties of raw and heat treated niger seed (*Guizotia abyssinica* Cass) flour.** *Indian Food Packer* 45(6): 1991: 27-32

The foaming properties of defatted and heated (dry and moist) niger seed flour was studied at varying pH (4.0, 6.0, 7.0, 8.0 and 10.0), protein concn. (0.5, 1.0, 1.5 and 2.0% wt./vol.), stirring time (1, 2, 3 and 4 min), stirring speed (5000, 7000 and 10,000 r.p.m.) and also with the addition of 2% NaCl and 2% sucrose. Dry and moist heat decreased the protein content and nitrogen solubility index by 10.5%. The foam expansion and stability were less in dry heat than in moist heat and also in defatted flour. The foam expansion and stability increased with increase in pH, protein concn., stirring time, stirring speed and addition of NaCl, but decreased with sucrose. GS

Soybeans

Soy products

Tofu

1160

Metussin (R), Alli (I) and Kermasha (S). **Micronization effects on composition and properties of tofu.** *Journal of Food Science* 57(2): 1992: 418-422

The proximate composition was determined on soy milk and tofu prepared from unprocessed and micronized (infrared heated) soybeans. The protein content of soymilk prepared from micronized beans was higher ($P < 0.5$) than that of the unprocessed beans indicating an increase in water dispersibility of soy protein as a result of micronization. The protein content of tofu from micronized beans was lower ($P < 0.5$) than that from the unprocessed beans, suggesting that micronization also affected the coagulation properties of the proteins. Tofu prepared from micronized beans and coagulated at 90 C using a mixture of citric acid (0.01 M) and calcium sulphate (0.03 M) showed improved characteristics. In terms of biochemical properties, the results showed that heat treatment had only minor effects on electrophoretic behaviour of protein components of the soy milk and tofu. SRA

Soy proteins

1161

Deeslie (WD) and Cheryan (M). **Fractionation of soy protein hydrolysates using ultrafiltration membranes.** *Journal of Food Science* 57(2): 1992: 411-413

The effect of membrane pore size on the mol. wt. distribution and selected functional properties of a protein hydrolysate produced from soy isolate and pronase was examined. Mol. wt. distributions were similar for permeates from 5000, 10,000 and 50,000 mol. wt. cut off (MWCO) membranes; two large fractions at 2300 and 1000 daltons. The 100,000 MWCO membrane resulted in three fractions of 25,000, 13,000 and 2300 daltons. Solubility of the hydrolysate increased with decrease in MWCO, while foam stability decreased. AS

1162

Ha (EYW), Morr (CV) and Seo (A). **Isoflavone aglucones and volatile organic compounds in soybeans: Effects of soaking treatments.** *Journal of Food Science* 57(2): 1992: 414-417, 436

The effect of three different soaking treatments (6 h in 50 C water; 6 h in 50 C 0.25% $NaHCO_3$ sol.; or 30 min boiling 0.25% $NaHCO_3$ sol.) was studied on the production of the major isoflavone aglucones, diadzein and genistein and headspace volatile organic compounds including aldehydes, alcohols and furans in soybeans. Boiling in 0.25% $NaHCO_3$ sol. effectively inhibited production of diadzein and genistein and also inhibited formation of hexanal, 2-hexenol, 1-heptanol, 1-octen-3-ol, 3-octanol

propanol and 3-methyl butanal, and lowered total headspace volatile organic compounds. SRA

TUBERS AND VEGETABLES

Carrots

1163
Mudahar (GS), Buhr (RJ) and Jen (JJ). **Infiltrated biopolymers effect on quality of dehydrated carrots.** *Journal of Food Science* 57(2): 1992: 526-529

The penetration pattern of biopolymers in plant tissue during processing was studied. Carrot dices were infused with dye-dextran standards of different mol. wt. (T10, T40, T70 and T500). Polymers of smaller size were found within the intercellular spaces and the cell walls. Larger polymers were found only in broken cells near the surface of the tissue. Biopolymers of small size were theorized to provide strength to the cell wall of plant tissue and assist in maintaining cellular integrity during dehydration. This was further verified in that the dextrans of mol. wt. 10,000 produced best quality dehydrated carrots with high rehydration ratio, more retention of carotenoids and high water-holding capacity. AS

Cassava

1164
Ayankunbi (MA), Keshinro (OO) and Egele (P). **Effect of methods of preparation on nutrient composition of some cassava products - garri (eba), 'lafun' and 'fufu'.** *Food Chemistry* 41(3): 1991: 349-354

Nutrient composition - moisture, crude protein, energy, sugar, iron, Ca and P for raw sample and sample of the cooked foods is presented. The gross energy values were 381.5 kcal for garri, 357.7 kcal for lafun and 180 kcal for fufu compared with 174.0 kcal for raw sample. SD

1165
Hongsprabhas (P) and Buckle (KA). **Cooked and raw cassava fermentation by fungi isolated from traditional fermented foods.** *ASEAN Food Journal* 6(2): 1991: 64-68

Cooked and raw cassava flour were used as substrate for biomass production in submerged fermentation. Filamentous fungi isolated in this study from tape ragi, and pure cultures from variety of sources (e.g. tempe) was investigated for their potential application as a protein supplement for animal feeding. Results indicated that *Aspergillus* spp. are potentially useful microorganisms for the protein enrichment of cassava considering the protein content in the mycelium (40.5% dry wt. basis), carbohydrate conversion and protein yield. Both *Rhizopus* spp. and *Aspergillus* spp. utilised cooked starch more efficiently than raw starch. 3.3 and 2.3 g/l protein was produced in both cooked and raw starch fermentation when ammonium sulphate was used as nitrogen source. SRA

Sugar beet

1166
Park (SC) and Baratti (J). **Comparison of ethanol production by *Zymomonas mobilis* from sugar beet substrates.** *Applied Microbiology and Biotechnology* 35(3): 1991: 283-291

The potential of four sugar beet substrates from the sugar industry [syrup (S), crystallizer effluent 1 (CE1), crystallizer effluent 2 (CE2) and molasses (M)] were compared for ethanol production using an osmotolerant mutant strain of the bacterium *Zymomonas mobilis*. Sucrose of the substrates was enzymatically hydrolysed to avoid levan formation during fermentation. Nutrient supplementation experiments have shown that reproudicible growth and ethanol production could be obtained on the four substrates supplemented only with magnesium sulphate (CE2 and M) or additionally with ammonium sulphate (S and CE1). Thus, addition of costly yeast extract could be avoided. All 20% (w/v) substrates showed nearly complete sugar conversion (> 94.9%), good growth (0.16 h^{-1}) and ethanol production (> 40 gl^{-1}). However, sorbitol formation reduced the ethanol yield (73 - 79% of the theoretical value) significantly. Batch kinetic parameters and studies of instantaneous parameters showed that enhanced osmolality of substrates (S < CE1 < CE2 < M) inhibited biomass production more strongly than ethanol production. In conclusion, all four sugar beet substrates could be utilized for ethanol production using this mutant strain of *Z mobilis* with appropriate supplementation. AS

Sweet potatoes

1167
Ahmed (EM), Chang (FC), Balaban (MO) and Arreola (AG). **Extrusion cooking of sweet potato roots.** *Journal of Food Quality* 14(3): 1991: 229-239

An extruded product was prepared using a mixture of sweet potato roots (SP), high protein wheat flour (WF), oil and water. The mixture was extruded in a Wenger X-5 extruder. The best physical

characteristics of the extruded product were obtained using drum dried baked sweet potato powder (DDSPP) and WF in the ratio of 3:1, oil content of 4.0% and an initial moisture content of 12.32%. This combination yielded a 4.33 fold expansion of the product. Physical measurements on the extruded product were: diam., bulk density, expansion and percent rehydration. The carotenoid content of the extruded product did not change considerably from that of DDSPP. The use of DDSPP:WF ratio of 3:1 represented 89.86% utilization of raw SP roots on fresh wt. basis. AS

1168

Koehler (PE) and Kays (SJ). **Sweet potato flavour. Quantitative and qualitative assessment of optimum sweetness.** *Journal of Food Quality* 14(3): 1991: 241-249

Known levels of individual sugars were added to a puree from non-sweet sweet potato baked roots and evaluated. Panelists distinguished 2.5% increments of added maltose between 10 - 25%, consistently ranked the sugars for preference as maltose > sucrose > fructose (for same level of sucrose equivalents - SE), 21SE as optimum for maltose and 38SE for fructose. Results indicate that starch hydrolysis and maltose formation contribute to flavour quality. SD

Vegetables

1169

Tee (E-S) and Lim (C-L). **Carotenoid composition and content of Malaysian vegetables and fruits by the AOAC and HPLC methods.** *Food Chemistry* 41(3): 1991: 309-339

1170

Joshi (HC), Joshi (KL), Joshi (N), Pant (PC), Joshi (NC), Gupta (BP), Joshi (MC). **Quality comparison of vegetables dehydrated in solar drier and electrical oven.** *Defence Science Journal* 41(1): 1991: 87-91

Solar dehydration of cabbage, cauliflower, tomato, radish, turnip, lahi, methi and palak was found better than electrical oven dehydration in terms of time, cost and quality. Blanching was found unnecessary and the dehydrated products showed a shelf-life of 12 - 18 months stored in sealed polyethylene bags at 10 - 35 C, RH 88 - 98% retaining original colour, texture and flavour. SD

1171

Lewis (JA), Fenwick (GR) and Gray (AR). **Glucosinolates in *Brassica* vegetables: Green-curded cauliflowers (*Brassica oleracea* L. Botrytis group) and purple-headed broccoli (*B. oleracea* L. Italica group).** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 361-363

The glucosinolate contents of (i) six lines of green-curded cauliflowers (Di Macerata), (ii) six lines of green-curded cauliflowers with pyramidal curds (Romanesco), and (iii) nine lines of purple-headed broccoli have been determined using HPLC. Total glucosinolate contents ranged between 18.4 - 42.8 mg 100 g^{-1} fresh wt. (i), 27.0 - 41.6 mg 100 g^{-1} (ii), and 72.0 - 212.2 mg 100 g^{-1} (iii). Total glucosinolate contents of green-curded cauliflower are thus lower than previously determined in the normal white-curded var., whilst the levels in purple-headed broccoli are higher than those found in the green-headed calabrese types. 3-Methylsulphinylpropyl and indolyl-3-methyl glucosinolates were the major components of all three classes, with 4-methylsulphinylbutyl glucosinolate also being present in significant amounts in Romanesco and purple-headed broccoli. The levels of total and individual glucosinolates determined in this investigation are discussed in the context of other brassicas and the anticarcinogenic properties of these vegetables. AS

Artichoke

1172

Choudhary (DK) and Kaul (BL). **Globe artichoke (*Cynara scolymus* L.) oil - a potential new source of essential polyunsaturated fatty acids.** *Research and Industry, India* 37(1): 1992: 29-30

Oil from globe artichoke seed was analysed by GLC for fatty acid composition. The oil contained linoleic acid (50.33%), oleic acid (41.6%), palmitic acid (1.35%) and stearic acid (6.59%). The oil has 91.4% essential polyunsaturated and 9% saturated fatty acids, which make it a good edible oil. GS

FRUITS

1173

Soleha (I), Kok Sian Ng and Mamat (SE). **Maintaining the storage quality of tropical dried fruit mix with glycerol.** *Journal of Food Quality* 14(3): 1991: 219-228

Pineapple and papaya cubes soaked in 60% sugar solution with 0.4% sodium metabisulphite and glycerol at 0, 15 and 20%; banana cubes treated with 0.4% potassium sorbate solution with 0, 15 and 20% glycerol without sugar; and were dried at 65 - 75 C for 5 - 10 h and mixed in equal proportion. A 300 g

samples packed in polypropylene bags of 0.04 mm thickness and stored in cardboard box at room temp. for 1 yr. Fruit mixture treated with 15 or 20% glycerol showed significantly better colour, appearance, texture and flavour than control. During storage, the colour of glycerol-treated banana darkened whereas glycerol-treated papaya became lighter and more red than the control. The glycerol treated fruit-mix which retained more SO_2 during storage, contained lower mold and bacterial counts. SD

Apples

1174

Fernandes (LI) and McLellan (MR). **Hydroxymethylfurfural accumulation in applesauce packaged in multilayer polymer films and glass.** *Journal of Food Science* 57(2): 1992: 530-531

Applesauce packaged in four different multilayer polymer films and glass was evaluated for changes in hydroxymethylfurfural content during storage. Packages were held for 15 wk at 20, 30, 37 and 43 C. Hydroxymethyfurlfural content was measured by HPLC analysis every 5 wks. For all package types more HMF was measured at higher storage temp. as expected, however, total amounts of HMF also varied according to package type. Comparison of HMF across package types as an index of thermal history would be of questionable value. AS

Jackfruit

1175

Ajay Singh, Sanjeev Kumar and Singh (IS). **Functional properties of jackfruit seed flour.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 373-374

The jackfruit *Artocarpus heteropyllus* Lam.) flour contained 16.3% protein (albumins and globulins); the solubility of protein was high at both acidic and alkaline pH and suggested a single isoelectric point at pH 4.0. The *in vitro* digestibility of protein was 89%. Water (14.1%) and fat (90.2%) absorption capacities, and emulsion capacity (17%) were comparable with that of soy flour and wheat flour. BV

Mombin fruits

1176

Bora (PS), Narain (N), Holschuh (HJ) and Vasconcelos (MAS). **Changes in physical and chemical composition during maturation of yellow mombin (*Spondias mombin*) fruits.** *Food Chemistry* 41(3): 1991: 341-348

Peaches

1177

Robertson (JA), Meredith (FI) and Forbus (WR). **Changes in quality characteristics during peach (cv. 'Majestic') maturation.** *Journal of Food Quality* 14(3): 1991: 197-207

Size, wt., ground colour 'a' values and SS/TA ratio increased significantly while firmness, DLE, hue angle, titratable acidity, quinic acid and citric acid decreased significantly with maturity. Malic acid, sucrose content and total sugars increased upto 5 - 6 grades and then decreased significantly with maturity. Sensory among maturity grades for sweeteness, sourness, juiciness and flavour evaluation showed no significant difference. Maturity and quality parameters except sour flavour showed highly significant correlation. SD

1178

Robertson (JA), Meredith (FI), Lyon (BG), Chapman (GW) and Sherman (WB). **Ripening and cold storage changes in the quality characteristics of nonmelting clingstone peaches (FLA 9-20C).** *Journal of Food Science* 57(2): 1992: 462-465

Minolta "a" values, SS/TA ratio, sucrose, total sugar contents, and sweet sensory scores increased significantly with increased degree of maturity of unripened peaches. Firmness, Minolta "L" values, hue angle, TA, sorbitol, green and sour flavour attributes, and peach complex and fruity/ester aromas decreased significantly with maturity. Maturity 1 and 2 peaches stored for 8 wk at 0 C and subsequently ripened showed no significant change in physical characteristics except for firmness which increased at 8 wk storage. Maturity 1 and 2 peaches could be ripened at 20 C for up to 15 days and stored at 0 C for 8 wk without notable change in quality. AS

Plums

1179

Parmar (C), Sud (G) and Nayital (RK). **Effect of triacontanol on the fruit size and quality of plum cv. Santa Rosa.** *Indian Food Packer* 45(6): 1991: 16-17

Triacontanol at concn. of 0, 1.5, 3.0 and 4.5 p.p.m. was applied just after the pit hardening stage of the fruits. The fruit size (wt. and vol.) and total soluble solids (TSS), acidity and vitamin C were determined at harvest. Fruit wt. and vol. increased to the max.

with 4.5 p.p.m. concn. TSS and total titratable acid decreased and vitamin C content slightly increased with the application of triacontanol. GS

CONFECTIONERY, STARCH AND SUGAR

Chocolates

1180

Larumbe (A), Gonzalez (HHL), Resnik (SL) and Chirife (J). **Moisture migration and mold growth in a composite chocolate product.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 307-309

The behaviour of caramel jam-filled chocolate candy during storage at room temp. was studied. Due to the transfer of moisture between components the a_w of the chocolate coating increased during storage at 25 C. This allowed growth of fungi, which contaminated the chocolate surface. Growth experiments at varied a_w with *Eurotium chevalieri* as a test microorganism confirmed this hypothesis. AS

Cocoa

1181

Abiola (SS) and Tewe (OO). **Chemical evaluation of cocoa by-products.** *Tropical Agriculture* 68(4): 1991: 335-336

The proximate constituents, gross energy and theobromine content of cocoa husk, shell, cake and dust showed nutritive value. Husk with high content of minerals, low theobromine can be more useful for animal feeds. SD

Cocoa bean

1182

Hernandez (B), Castellote (AI) and Permanyer (JJ). **Triglyceride analysis of cocoa beans from different geographical origins.** *Food Chemistry* 41(3): 1991: 269-276

BAKERY PRODUCTS

Bread

1183

Rabe (E) and Seibel (W). **Determination of flour in whole meal breads.** *Getreide-Mehl und Brot* 44(6): 1990: 170-175 (De)

1184

Jud (B) and Brumer (JM). **Production of gluten-free breads, using special galactomannans.** *Getreide-Mehl und Brot* 44(6): 1990: 178-183 (De)

1185

Becker (HG), Brodhagen (D) and Stellar (W). **Purchase patterns and food habits of the elderly concerning bread and rolls.** *Getreide-Mehl und Brot* 44(6): 1990: 187-190 (De)

1186

Spicher (G), Rabe (E) and Driller (KH). **Influence of adding of bread on sour dough fermentation.** *Getreide-Mehl und Brot* 44(7): 1990: 202-208 (De)

1187

Sidhu (JS), Seibel (W), Brummer (J-M) and Zwingelberg (H). **Comparison of different whole wheat flours for performance in bread and chapathi.** *Getreide-Mehl und Brot* 44(7): 1990: 208-210 (De)

Muffins

1188

Holt (SD), Mcwatters (KH) and Resurreccion (AVA). **Validation of predicted baking performance of muffins containing mixtures of wheat, cowpea, peanut, sorghum, and cassava flours.** *Journal of Food Science* 57(2): 1992: 470-474

Eight formulations containing wheat, cowpea, peanut, sorghum and cassava flours showed no significant differences for 22 of 31 compositional, physical and sensory measurements when compared to traditional wheat flour formulations. Two formulations, one containing 25% each of wheat, peanut, sorghum and cassava flours and the other containing 66.7% wheat and 16.6% each of cowpea and peanut flours differed most from the control. Significant correlations between some sensory attributes and physical and compositional measurements were observed. SRA

Rolls

1189

Wassermann (L). **Frosted doughs for rolls: recipies.** *Getreide-Mehl und Brot* 44(7): 1990: 218-220 (De)

1190

Brummer (J-M) and Morgenstern (G). **Frosted doughs for rolls: mixing-fermentation-freezing.** *Getreide-Mehl und Brot* 44(7): 1990: 220-221 (De)

1191

Heberer (G). **Frosted doughs for rolls: calculation.** *Getreide-Mehl und Brot* 44(7): 1990: 221-222 (De)

MILK AND DAIRY PRODUCTS

1192

Garg (SK) and Mital (BK). **Enterococci in milk and milk products.** *CRC Critical Reviews in Microbiology* 18(1): 1991: 15-45

The significance of microorganisms in milk and milk products, with reference to public health potential is reviewed. Aspects covered are: incidence, classification (taxonomy, serological grouping, phage typing and enterocin typing), characteristics and growth, heat resistance, inhibitory properties, antibiotic sensitivity, biochemical pathways (glucose metabolism, gluconate metabolism, malate metabolism, polyols and myoinositol utilization, acetoin formation), extracellular products (gelatinase, deoxyribonuclease, hemolysin, hyaluronidase, lipase), enumeration, isolation and identification, public health significance (agents of disease, pressor amines), use as index organisms and use in product manufacture. 251 references. SRA

1193

Patel (RS), Reuter (H), Prokopek (D) and Sachdeva (S). **Manufacture of low-lactose powder using ultrafiltration technology.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 338-340

Milk

1194

Augustin (M-A) and Clarke (PT). **Calcium ion activities of cooled and aged reconstituted and recombined milks.** *Journal of Dairy Research* 58(2): 1991: 219-229

Milk powders were subjected during manufacture to the following treatments: low-, medium- or high-heat, indirect or direct UHT preheat, or no preheat. The Ca^{2+} activity-pH profiles of reconsitituted milks (9% total solids, TS) in the pH range 6.06 - 6.98 and reconstituted concentrated milks (19.6% TS) and recombined concentrated milks (26% TS, 18% SNF, 8% fat) in the pH range 6.27 - 6.69 were determined. Statistical analysis of the results using a (-in Ca^{2+} activity) transformation was used to quantify the effects of pH, preheat treatment and fat incorporation on Ca^{2+} activity. pH had a dominant effect on Ca^{2+} activity and the effects of preheat treatment and fat incorporation were small in comparison. Depending on the batch of milk used for preparation of powders, pH accounted for 98.8 - 98.9%, 96.4 - 96.7% and 93.7 - 97.3% of the total variation in Ca^{2+} activity in reconstituted milks, reconstituted conc. milks and recombined conc. milks. The corresponding contributions of preheat treatment to variation in Ca^{2+} activity were 0.26 - 0.47%, 0.34 - 1.67% and 0.24 - 0.40%. The addition of fat to reconstituted conc. milk to yield recombined conc. milk with the same SNF: water ratio resulted in 0.03 - 3.71% variation in Ca^{2+} activity. The results suggested that differences in heat stability among powders subject to different preheat treatments are not likely to be linked to Ca^{2+} activity. AS

1195

Rajagopal (SN) and Sandine (WE). **Associative growth and proteolysis of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* in skim milk.** *Journal of Dairy Science* 73(4): 1990: 894 899

Proteolytic activities of 9 strains of *Streptococcus thermophilus* and 9 strains of *Lactobacillus bulgaricus* cultures incubated in pasteurized reconstituted NDM at 42 C as single and mixed cultures were studied. Lactobacilli were highly proteolytic (61.0 to 144.6 µg of tyrosine/ml of milk) and *S. thermophilus* were less proteolytic (2.4 to 14.8 µg of tyrosine/ml of milk). Mixed cultures, with the exception of one combination, liberated more tyrosine (92.6 to 419.9 µg/ml) than the sum of the individual cultures. Mixed cultures also produced more acid (lower pH). Of 81 combinations of *L. bulgaricus* and *S. thermophilus* cultures, only one combination was less proteolytic (92.6 µg tyrosine/ml) than the corresponding *L. bulgaricus* strain in pure culture (125 µg tyrosine/ml). AS

1196

Gandolfi (I), Palla (G), Delprato (L), De Nisco (F), Marchelli (R), Salvadori (C). **D-amino acids in milk as related to heat treatments and bacterial activity.** *Journal of Food Science* 57(2): 1992: 377-379

The occurrence in milk of free and bound D-amino acids was investigated by chiral phase GC and related to heat treatments and bacterial activity. Significant amounts of free D-alanine (D-Ala), D-aspartic acid (D-Asp), and D-glutamic acid (D-Glu) have been found in raw cow milk but not in human milk. The amount did not increase by pasteurization, UHT treatment, and sterilization. In contrast, the content of D-Ala in raw milk samples increased during cold storage at 4 C, and it was suggested that D-Ala may be considered as an

indicator of bacterial milk contamination. The presence of D-Ala, D-Asp and D-Glu detected in milk protein hydrolysates was due to hydrolysis conditions. AS

1197

Patel (AA) and Frede (E). **Studies on thermal properties of cow and buffalo milk fats.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 323-327

Cow (summer and winter) and buffalo (spring and summer) milk fats were studied for their solidification and melting properties using differential scanning calorimetry and nuclear magnetic resonance spectroscopy. Buffalo milk fats began to crystallize at a higher temp. (about 20 C) than did cow milk fats (15 - 18 C). A large portion of the former solidified in the higher temp. range than did the latter. Also, buffalo milk fats melted over a higher temp. range (11 - 38 C) than did cow milk fats (5 - 35 C), the former showing, again, a considerably higher proportion of the high-melting component as compared to the latter. The Indian cow (summer) fat exhibited an intermediate crystallization and melting behaviour between the buffalo fat and German cow (summer) fat. Melting at increasingly higher temp., and crystallization upon progressive holding at 0 C monitored in terms of solid fat content (SFC) revealed more or less similar differences between the different milk fats investigated. However, the Indian cow milk fat showed higher SFC values than did buffalo milk fats during early melting and crystallization processes. The spring buffalo fat appeared to be a higher melting type in comparison with the summer buffalo fat, whereas the German winter (cow) fat showed a higher melting range than that for the German summer fat. Probable compositional differences attributable to the observed variations in thermal properties are discussed. AS

1198

Pagliarini (E), Fortina (MG) and Vernile (M). **Study on optimizing conditions for the thermal stabilization of milk.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 334-337

This experiment demonstrates that by carrying out a two-step treatment, milk can be obtained having a stability comparable with that of in-bottle sterilized milk, while heat damage is only slightly higher than that in UHT-milk. BV

Milk products

1199

Salih (MA), Sandine (WE) and Ayres (JW). **Inhibitory effects of microgard^{TM} on yoghurt and cottage cheese spoilage organisms.** *Journal of Dairy Science* 73(4): 1990: 887-893

Three different concn. of freeze-dried Microgard^{TM} were investigated for their inhibitory action against spoilage organisms in two commercial brands of strawberry-flavoured yoghurt. Evaluation of the Microgard^{TM} activity in the commercial yoghurt samples focused on acid tolerant yeasts and gram-negative bacteria. Yeasts were the principal spoilage organisms contaminating commercial yoghurts. Microgard^{TM} (10% concn.) inhibited viable yeasts and preserved one commercial yoghurt brand for over 82 days at 5 C. In the other yoghurt brand, yeasts were not eliminated, but their early growth was resitricted by 10% Microgard^{TM}. The inhibitory action of Microgard^{TM} against yeasts was concn. dependent. The Microgard^{TM}-supplemented yoghurts were also protected from spoilage by gram-negative psychrotrophs which grew out following pH increases as a result of yeast growth. In the case of commercially produced cottage cheese, a significant reduction in spoilage due to inhibition of gram-negative psychrotrophs by liquid Microgard^{TM} was observed. In 24 days, 90% (105 out of 114 cartons) of cottage cheese that contained liquid Microgard^{TM} had less than 800 gram-negative bacteria/g of cottage cheese. In 30 days, 68% (78 out of 114 cartons) of the cottage cheese had undetectable levels of spoilage organisms (< 100/g) when the cottage cheese was kept at 7 C. Less than 1% of cottage cheese that contained liquid Microgard^{TM} showed any surface growth (mold) and 33% of the cottage cheese that did not contain liquid Microgard^{TM} underwent surface spoilage in 21 days. AS

Cheese

1200

Bhowmik (T) and Marth (EH). **Role of *Micrococcus* and *Pediococcus* species in cheese ripening: A review.** *Journal of Dairy Science* 73(4): 1990: 859-866

This review covers description of micrococci, occurrence of micrococci in milk and cheese, significance and use of micrococci in cheese ripening, proteolytic, lipolytic and esterolytic enzymes of micrococci, description of pediococci, occurrence of pediococci in milk and cheese, significance and use of pediococci in cheese ripening and enzymes of pediococci. 87 references. BV

1201

Bican (P) and Spahni (A). **Low molecular-mass nitrogen components in ripening cheese.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 315-322

This study examines and compares cheese extraction procedures for samples from different stages of ripening; and development of a precise, reproducible and time-saving method of analysing cheese low mol.-mass N components. BV

Cheddar cheese

1202

Farkye (NY), Fox (PF), Fitzgerald (GF) and Daly (C). **Proteolysis and flavour developments in Cheddar cheese made exclusively with single strain proteinase-positive or proteinase-negative starters.** *Journal of Dairy Science* 73(4): 1990: 874-880

Proteolysis and flavour development in Cheddar cheese made with proteinase-positive *Lactococcus lactis* ssp. *cremoris* UC 317 or its proteinase-negative variant UC 041 were monitored during ripening. Qualitatively, electrophoretograms of the cheeses were similar throughout ripening, but electrophoretograms of water-soluble N extracts from the proteinase-negative cheeses were significantly different from those of the proteinase-positive cheeses. The levels of water-soluble N proteinase-positive and proteinase-negative cheeses of the same age were not significantly different. However, the proteinase-positive cheese had a significantly higher level of amino N throughout ripening. Proteinase-positive cheeses received slightly higher scores for flavour and body and texture than proteinase-negative cheeses of the same age. Nevertheless, the overall quality of all the cheeses was good, suggesting that starter peptidase activity may be more important than starter proteinases in flavour development in cheese during ripening. AS

1203

Lakhani (S), Gullett (EA), Ferrier (LK) and Hill (AR). **Texture analysis of Cheddar cheese made from ultrafiltered milk.** *Journal of Food Quality* 14(3): 1991: 251-271

A trained panel assessed the texture of Cheddar cheese made from ultrafiltered (UF) milk as harder, more rubbery, crumbly ($P < 0.01$), chewy and grainy than control and commercial samples but texture profile analysis by Instron showed no significant difference. A consumer panel showed significantly less preference to UF cheese for flavour, texture and overall acceptability than control and commercial samples. SD

1204

Trepanier (G), El Abboudi (M), Lee (BH) and Simard (RE). **Accelerated maturation of Cheddar cheese: Microbiology of cheeses supplemented with *Lactobacillus casei* subsp. *casei* L2A.** *Journal of Food Science* 57(2): 1992: 345-349

Growth of lactic acid bacteria (LAB) and lactobacilli was studied in Cheddar cheeses supplemented with live and heat-shocked *Lactobacillus casei* subsp. *casei* L2A and with Neutrase to accelerate maturation. Bacterial counts of treated cheeses rapidly reached maximal values within 1 wk, whereas the control cheese reached comparable values only after 2 months. Addition of 1.0% heat-shocked lactobacilli led to an excellent quality Cheddar cheese with a 50% increase in flavour development, as determined by sensory evaluation, compared to control cheese. Addition of Neutrase (1×10^{-5} AU/g cheese) permitted a gain of an additional 10% while addition of higher concn. (2 and 4×10^{-5} AU/g cheese) resulted in undesirable bitterness. AS

1205

Li-Chan (E), Kwan (L), Nakai (S) and Amantea (GF). **Silica-based and polymeric columns for reversed-phase HPLC analysis of Cheddar cheese.** *Journal of Food Science* 57(2): 1992: 350-354

Octadecyl polymeric (ODP) vs octadecyl silica (ODS) reversed phase high-performance liquid chromatography (RP-HPLC) columns were compared for analytical separation of water-soluble fractions extracted from Cheddar cheese. A polystyrene divinylbenzene copolymer-based column did not resolve cheese water-soluble components. Good resolution was achieved on a vinyl alcohol copolymer ODP column as well as two ODS columns under optimized conditions of gradient elution, using increasing concn. of aqueous acetonitrile containing ion-pair reagent. However, the ODP column had longer useful life characteristics. Use of phosphoric instead of trifluoroacetic acid as ion-pair reagent produced a more stable chromatogram baseline and may prolong column useful life. ODP-RP-HPLC could be useful to monitor ripening of Cheddar cheese samples. AS

Chihuahua cheese

1206

Diaz-Cinco (ME), Fraijo (O), Grajeda (P), Lozano-Taylor (J) and Gonzalez De Media (E). **Microbial and chemical analysis of chihuahua cheese and relationship to histamine and tyramine.** *Journal of Food Science* 57(2): 1992: 355-356, 365

Kashar cheese

1207

Topal (RS). **Effects of different packaging materials and techniques on the curing of Kashar cheese and on its surface moulds.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 341-349

The effect of vacuum packaging in the CRYOVAC^{R}, BK_1, BK_3, BB_3 series on the curing of Kashar cheese with special attention to mould growth inhibition and cheese characteristics. During a 5-month storage period the use of these materials was investigated at monthly-intervals in comparison with traditional Kashar under normal storage conditions and packaging in a polyamide/polyethylene laminated pouch. The application of BK_1 and BB_3 types of the vacuum-shrink system after the preripening stage was found to be the best type of packaging/maturation. The application brings about 16% reduction in Kashar cheese losser/yr. In standard PA/PE vacuum-packed groups, a vacuum loss of around 25% and damage to the packages were observed after 3 months storage. BV

Mozzarella cheese

1208

Kindstedt (PS) and Rippe (JK). **Rapid quantitative test for free oil (oiling off) in melted Mozzarella cheese.** *Journal of Dairy Science* 73(4): 1990: 867-873

A test for free oil in melted Mozzarella cheese using standard Babcock equipment was developed and evaluated. 18 g of whole milk or part skim Mozzarella were weighed into 50 or 20% Paley-Babcock bottles, respectively. Bottles were immersed in boiling water for 4.0 min to melt cheese. Distilled water (20 ml at 57.5 C) was then added and the bottles were centrifuged hot (ca. 57.5 C) for 10 min. A portion of 1:1 distilled water:methanol (21 C) was added to a final level in the upper region of the calibrated neck and then centrifuged for 2 min. Bottles were then rocked by hand for 10 second, centrifuged for 2 min, and a second time rocked by hand for 10 second and centrifuged for 2 min. Finally, bottles were tempered in 57.5 C water for 5 min and the fat column then measured with glymol. This procedure gave a clear, defined fat column. Free oil was expressed as percentage in cheese and percentage in cheese fat. A series of recovery trials in which low moisture and part skim Mozzarellas were spiked with butter oil gave recoveries ranging from 97.3 to 104.5%. 18 replicates of a low moisture, part skim Mozzarella gave coeff. of variation of 3.3 and 6.2%, respectively. Free oil was measured in 64 Mozzarella cheese obtained from local supermarkets and two industrial cheese plants. Free oil as a percentage of total cheese fat ranged from 8.8 to 84.9%. Free oil increased with increasing cheese fat on a dry basis. AS

Milk powder

1209

Veld (PHI), Soentoro (PSS), Asch (EHMD) and Notermans (S). **Influence of reconstitution on isolation and enumeration of *Listeria monocytogenes* from milk powder used for reference samples.** *Journal of Food Protection* 54(2): 1991: 124-126

To test the performance of the *listeria* isolation methods, reference samples consisting of gelation capsules filled with spray-dried milk powder containing *Listeria* have been developed. During the spray-drying process the *Listeria* cells are exposed to heat stress and are susceptible to osmotic stress during the reconstitution procedure. To limit the effect of osmotic shock, the milk powder has to be encapsulated in gelatin in order to guarantee slow dissolution. Furthermore, the capsules have to be preenriched in a nonselective medium. The practical consequences of these findings are discussed. AS

Paneer

1210

Shere (DM), Rathi (SD), Babje (JS) and Pawar (SG). **Studies on qualities of *paneer* from buffalo milk, soya milk and soy-buffalo blend.** *Indian Food Packer* 45(6): 1991: 37-41

Paneer was prepared by blending 10, 20 and 30% soy milk with buffalo milk and also using buffalo milk and soy milk alone. $CaCl_2$ was added at the rate of 0.5, 0.1 and 0.02% levels. Moisture, fat, ash and protein content were determined. *Paneer* prepared with higher concn. of $CaCl_2$ scored lowest for body and texture, flavour and taste; 0.02% $CaCl_2$ improved the product without affecting its chemical composition. Buffalo milk *paneer* was rated highest and those made from 10 and 20% soy milk sensorily resembled buffalo milk *paneer*. Soy milk *paneer* had the highest moisture and protein contents but lowest content of solids (30.21) and fat. GS

Wheys

1211

Brandenberg (AH), Morr (CV) and Weller (CL). **Gelation of commercial whey protein concentrates: Effect of removal of**

low-molecular-weight components. *Journal of Food Science* 57(2): 1992: 427-432

Low-mol.-wt. solutes were removed from reconstituted, commercial whey protein concentrate (WPC) and isolate (WPI) by centrifugal gel filtration. Effects on gelation properties were investigated as a function of pH, protein concn., and mineral ion addition by least concn. endpoint (LCE) and uniaxial compression testing. Partial removal of low-mol.-wt. solutes had little effect on WPC and WPI gelation. Lowest LCE values were obtained at pH 6, 0.2M ion addition, and with KCl and $CaCl_2$ addition. Highest gel firmness (shear stress and strain) values were at pH 6 and 7.5, and 0.1M ion addition. WPI functioned better than WPC by both test procedures. AS

1212

Fairbrother (P), George (WO) and Williams (JM). **Whey fermentation: On-line analysis of lactose and lactic acid by FTIR spectroscopy.** *Applied Microbiology and Biotechnology* 35(3): 1991: 301-305

The batch fermentation of whey permeate by *Lactobacillus helveticus* 8652, was monitored on-line by Fourier transform infrared (FTIR) spectroscopy. Substrate (lactose) and product (lactic acid) levels were measured over a period of 47 h. A method for the quantitative analysis of the two components was first established. Fifteen standard solutions containing both lactose and lactic acid were used. The method developed was tested using validation samples of known composition. Mean errors of 1.1% and 0.9% were attained in the measurement of lactose and lactic acid respectively. Sample analysis is fast (approx. 3 min), simple and almost completely automated. The results obtained with FTIR spectroscopy compared favourably with samples analyzed off-line using enzyme kits. AS

1213

Sanchez (HD), De La Torre (MA), Osella (CA), Mancuello (C), Maffia (LM), Kuck (AM), Gallina (R), Renner (E), Drathen (M). **Application of whey-protein-concentrates with the production of soda-crackers.** *Getreide-Mehl und Brot* 44(6): 1990: 183-186 (De)

Yoghurts

1214

Ramaswamy (HS) and Basak (S). **Pectin and raspberry concentrate effects on the rheology of stirred commercial yoghurt.** *Journal of Food Science* 57(2): 1992: 357-360

The rheological properties of stirred yoghurt were influenced by addition of pectin (0.0 - 0.5%) and raspberry concentrate (64°B: 0 - 10%). Pectin resulted in increased sample viscosity that was more shear-stable, while increased viscosity resulting from the addition of concentrate was less shear-stable. The rheology of flavoured yoghurt could be designated or controlled by mixing stirred yoghurt with suitable proportions of pectin and/or fruit concentrates. SRA

Milk proteins

1215

Tsoubeli (MN) and Labuza (TP). **Influence of dairy proteins on aspartame stability in the pH 6-7 range.** *Journal of Food Science* 57(2): 1992: 361-365

Aspartame stability in the presence of caseinates significantly decreased the pseudo first order loss rate at low buffer concn. and higher temp. (70 - 80 C), whereas the rate was faster in the presence of casein/whey mixture. At high buffer concn., the rate of loss was not affected by protein. At 4 and 30 C, the rate of loss was not affected by calcium caseinate. SRA

1216

Klemaszewski (JL), Das (KP) and Kinsella (JE). **Formation and coalescence stability of emulsions stabilized by different milk proteins.** *Journal of Food Science* 57(2): 1992: 366-371, 379

The vol. fraction of oil emulsified, surface area, droplet diam., and coalescence rates of emulsions stabilized by different milk proteins were studied at protein concn. of 0.25, 0.5, 1.0 and 2.0% (w/w); pH 4, 5, and 7; and ionic strengths 0.1 and 0.2. The emulsion activity index and coalescence stability generally increased with increasing protein solubility and hydrophobicity. The vol. fraction of oil emulsified decreased with increasing ionic strength. Coalescence stability correlated with droplet diam. for emulsions stabilized by α-lactalbumin, β-lactoglobulin, and sodium caseinate (r^2 = 0.96). With the exception of β-lactoglobulin-stabilized emulsions, coalescence stability was largely unaffected by pH. AS

1217

Hung (SC) and Zayas (JF). **Protein solubility, water retention, and fat binding of corn germ protein flour compared with milk proteins.** *Journal of Food Science* 57(2): 1992: 372-376, 384

Protein solubility (PS), water retention (WR), and fat binding (FB) of corn germ protein flour (CGPF), nonfat dry milk (NFDM), whey protein concentrate

(WPC), and sodium caseinate (SC) were comparatively studied using response surface methodology. PS and WR of all samples were affected by pH except for WR of CGPF. PS and WR of all samples were not affected by incubation temp. except of WR of CGPF. Incubation temp. influenced FB of CGPF and WPC but not of NFDM and SC. Sample concn. significantly affected FB of all samples. CGPF was an effective protein source in terms of WR and FB. For FB, SC > CGPF=NFDM > WPC and for PS, WPC=NFDM=SC > CGPF. AS

MEAT AND POULTRY

1218

Rose (BE), Llabres (CM) and Bennett (B). **Evalaution of a colorimetric DNA hybridization test for detection of *Salmonellae* in meat and poultry products.** *Journal of Food Protection* 54(2): 1991: 127-130

A commercially available colorimetric DNA hybridization test was compared with the USDA/FSIS conventional culture method for detection of salmonellae in naturally contaminated meat and poultry products and inoculated ground beef samples. All samples which were *Salmonella*-positive by the culture method were also positive by the DNA probe assay. There were no false-negative or false-positive results by the colorimetric DNA hybridization test, which was slightly more sensitive than the culture method. AS

1219

Hayakawa (I), Kajihara (J), Morikawa (K), Oda (M) and Fujio (Y). **Denaturation of bovine albumin (BSA) and ovalbumin by high pressure, heat and chemicals.** *Journal of Food Science* 57(2): 1992: 288-292

1220

Faustman (C), Yin (MC) and Nadeau (DB). **Colour stability, lipid stability and nutrient composition of red and white veal.** *Journal of Food Science* 57(2): 1992: 302-304, 311

Meat

1221

McCormick (RJ), Collins (DA), Field (RA) and Moore (TD). **Identification of meat from game and domestic species.** *Journal of Food Science* 57(2): 1992: 516-517, 520

Isoelectric focusing combined with specific enzyme staining for creatine kinase was used to characterize banding patterns in meat from pronghorn, mule deer, white-tailed deer, sheep, moose, pork, bison, elk, caribou, red deer, beef and goat. Processed and cooked pork was differentiated from all species and beef and elk were separated from pronghorn. It was not possible to differentiate beef from elk, or pronghorn from sheep. The inability to separate some game from some domestic sp. and the lability of the staining proteins after heating above 67 C limits the application of this technique. AS

1222

Loprieno (N), Boncristiani (G) and Loprieno (G). **An experimental approach to identify the genotoxic risk from cooked meat mutagens.** *Food and Chemical Toxicology* 29(6): 1991: 377-386

In order to define the toxicological risk to the human population from the chemical compounds formed during the process of cooking animal meat, which have been described as possessing mutagenic, genotoxic and carcinogenic activities, an extensive study was undertaken of cooked meat extract and two cooked meat mutagens, 2-amino-3-methylimidazo(4,5-f)quinoline (IQ) and 2-amino-3,8-dimethylimidazo(4,5-f)quinoxaline (MeIQx). The study involved toxicokinetics and mouse-tissue distribution studies of the two chemicals, *in vitro* and *in vivo* mutagenicity/genotoxicity analyses (i.e. the detection of gene mutations, chromosome aberrations and micronuclei in mouse bone marrow cells, and mouse urine and faeces mutagenicity tests), as well as *in vivo* protein and DNA binding assays. IQ and MeIQx were found to be positive for the induction of gene mutations in *Salmonella typhimurium* TA98, but not in Chinese hamster V79 cells: IQ only was found to be positive for the induction of chromosome aberrations in Chinese hamster ovary cells and cultured human lymphocytes. IQ and MeIQx were negative for the induction of micronuclei in mice treated with 40 mg chemical/kg body wt.; the lowest effective dose administered to the mice that produced mutagenic urine was 0.4 mg IQ/kg body wt. and 0.04 mg MeIQx/kg. A dose of 40 mg IQ/kg, given orally by gavage to mice, produced an excretion of 1 - 4% of the applied dose in the urine and 0.1 - 2% of the applied dose in the faeces, when evaluated chemically or mutagenically. The number of DNA adducts in the liver correlated with the dose of IQ or MeIQx administered to the mice. All the data have been used for defining a possible risk estimate to the human population as a consequence of a cooked meat diet. AS

Beef

1223

Fu (A-H), Molins (RA) and Sebrabek (JG). **Storage quality characteristics of beef rib eye steaks packaged in modified atmospheres.** *Journal of Food Science* 57(2): 1992: 283-287, 301

1224

Siragusa (GR) and Dickson (JS). **Inhibition of *Listeria monocyotgenes* on beef tissue by application of organic acids immobilized in a calcium alginate gel.** *Journal of Food Science* 57(2): 1992: 293-296

1225

Dickson (JS). **Acetic acid action on beef tissue surfaces contaminated with *Salmonella typhymurium*.** *Journal of Food Science* 57(2): 1992: 297-301

1226

Oreskovich (DC), Bechtel (PJ), McKeith (FK), Novakofiski (J) and Basgall (EJ). **Marinade pH affects textural properties of beef.** *Journal of Food Science* 57(2): 1992: 305-311

1227

Arnold (RN), Scheller (KK), Arp (SC), Williams (SN) and Schaefer (DM). **Visual and spectrophotometric evaluations of beef colour stability.** *Journal of Food Science* 57(2): 1992: 518-520

Mutton

Sheep

1228

Farid (A). **Carcass physical and chemical composition of three fat-tailed breeds of sheep.** *Meat Science* 29(2): 1991: 109-120

Physical and chemical composition of carcasses of 73 intact ram lambs of three fat-tailed Iranian breeds: Karakul (K), Mehraban (M) and Baluchi (B) were studied. Lambs were 195 days old at slaughter. Wt. of wholesale cuts and bone, fat trim and trimmed meat of each cut were recorded. Moisture, protein, ether extract and ash were determined in each of the deboned cuts. The higher ($P < 0.01$) proportion of leg and shoulder in K compared with those in other two breeds was due to a smaller ($P < 0.01$) tail fat in the former breed. The breeds were not different for wt. of wholesale cuts as percentage of tail-free carcasses. Tail-free carcass of K lambs had the highest percentage of bone, protein and moisture, and those of M had the highest fat trim and the lowest bone as compared with the other breeds. The small-size Baluchi, which is well adapted to the sub-desert conditions, was the fattest of the breeds, as assessed by its highest ranking for percentage of ether extract in the carcass. On the basis of protein content, the values of M and B tail-free carcasses were 93% and 89% as high, respectively, as that for K. Differences among the breeds for the physical and chemical constituents of wholesale cuts as a percentage of the same component in half carcass without tail were small. On the basis of percentage protein, the values of shoulder, back and flap + neck were 102, 98 and 85% as high, respectively, as that for leg. AS

Pork

1229

Toldra (F), Torrero (Y) and Flores (J). **Simple test for differentiation between fresh pork and frozen/thawed pork.** *Meat Science* 29(2): 1991: 177-181

Pigs

1230

Lonergan (SM), Sebranek (JG), Prusa (KJ) and Miller (LF). **Procine somatotropin (PST) adminstration to growing pigs: Effects on adipose tissue composition and processed product characteristics.** *Journal of Food Science* 57(2): 1992: 312-317

1231

Lentsch (DM), Prusa (KJ) and Miller (LF). **Composition, separation and denaturation of *Longissimus* muscle proteins from pigs treated with porcine somatotropin (pSt).** *Journal of Food Science* 57(2): 1992: 318-321

1232

Dransfield (E), Ledwith (MJ) and Taylor (AA). **Effect of electrical stimulation, hip suspension and ageing on quality of chilled pig meat.** *Meat Science* 29(2): 1991: 129-139

1233

Oliver (MA), Gispert (M), Tibau (J) and Diestre (A). **The measurement of light scattering and electrical conductivity for the prediction of PSE pig meat at various times of post-mortem.** *Meat Science* 29(2): 1991: 141-151

Rabbits

1234

Cambero (MI), Hoz (L), Sanz (B) and Ordonez (JA). **Lipid and fatty acid composition of rabbit meat. Part I. Apolar fraction.** *Meat Science* 29(2): 1991: 153-166

The apolar lipid contents and the fatty acid composition of meat from two rabbit breeds (New Zealand white and commercial hybrid HYLA) fed two commercial diets of different protein and crude fibre levels have been studied. The total and apolar lipid content of meat from both rabbit breeds ranged from 4.9 to 10.5% (wet wt.). The individual lipid classes of the apolar fraction are described. Triglycerides accounted for more than 80% of total apolar lipids. The fat from rabbit meat is comparatively richer in palmitic acid (about 40% being always the major fatty acid), in linoleic acid and in myristic acid and poorer in stearic acid than other meats. Although differences in the fatty acid compositions of meat were observed, only clear influences of age, sex, breed, and/or feeding on the fatty acid C-16:0, C-18:2 of total and apolar lipids were found. AS

1235

Cambero (MI), Hoz (L), Sanz (B) and Ordonez (JA). **Lipid and fatty acid composition of rabbit meat. Part 2. Phospholipids.** *Meat Science* 29(2): 1991: 167-176

The phospholipid contents (and their fatty acid composition) of the meat of two rabbit breeds (New Zealand white and the commercial hybrid HYLA) fed with two commercial diets of different protein and fibre contents, have been determined. The phospholipid contents in the meat of both rabbit breeds ranged from 9 to 19% total lipid. In this fraction seven different phospholipid classes were detected but phosphatidylcholine (PC) and phosphatidylethanolamine (PE) had av. percentages of 50 and 20 of the total phospholipids. The major fatty acids of both phosphatidylcholine and phosphatidylethanolamine were C-16:0, C-18:0, C-18:1 and C-18:2, these together representing more than 70% of the total fatty acids. In general, the PC had an higher saturated fatty acid content than PE, which had a lower percentage of C-16:0 but higher C-20:4. Although differences in the fatty acid composition of the phospholipid fractions of the rabbit meat were observed, the only clear influences of age, sex, breed, and/or feeding were found with the C-16:0, C-18:0 and C-18:2 fatty acids. AS

Products

1236

Lazarides (HN). **Application of the transformed GAB equation to delineate moisture sorption behaviour of an intermediate moisture meat product.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 310-314

The Guggenheim-Anderson-De Boer (GAB) and the HALSEY isotherm equations were evaluated for goodness of fit to moisture sorption data of basturma, a traditional intermediate moisture meat product. The GAB equation gave satisfactory goodness of fit for a_w values between 0.4 and 0.9, with mean relative deviation modules (E) values close to or less than 5%. The HALSEY equation gave much higher E-values, indicating a limited ability of this isotherm model to describe moisture sorption behaviour of the specific product. Practical implications on processing, packaging and storage of the product are discussed. AS

Ham

1237

Harmon (CJ), Means (WJ) and Kemp (JD). **Bind, sensory and chemical properties of restructured dry-cured hams.** *Journal of Food Science* 57(2): 1992: 322-324

Poultry

1238

Conner (DE). **Temperature and NaCl affect growth and survival of *Escherichia coli* 0157:H7 in poultry-based and laboratory media.** *Journal of Food Science* 57(2): 1992: 532-533

In tryptic soy broth (TSB) and a poultry extract broth (PB) with 0 to 10% (w/v) NaCl incubated at 37 C, growth of E. coli 0157:H7 was inhibited at greater than or equal to 8% NaCl whereas at 10 C, growth was inhibited at greater than or equal to 4% NaCl in TSB and at greater than or equal to 6% NaCl in PB. The bacterium did not grow at 4 C. Increased NaCl-sensitivity observed at 10 C was a bacteriostatic effect that was ineffective with increasing incubation temp. At 10 C, *E. coli* 0157:H7 was more salt-tolerant in PB than in TSB, although PB growth rates were lower. Findings suggest that PB may be more suitable medium for testing *E. coli* 0157:H7 in poultry products. Cells of *E. coli* 0157:H7 that were exposed to refrigeration (4 C) and/or NaCl for 24 days did not grow on MacConkey agar with 1% sorbitol. AS

Chickens

1239

Yang (TS) and Froning (GW). **Selected washing processes affect thermal gelation properties and microstructure of mechanically deboned chicken meat.** *Journal of Food Science* 57(2): 1992: 325-329

1240

Lamuka (PO), Sunki (GR), Chawan (CB), Rao (DR) and Shackelford (LA). **Bacteriological quality of freshly processed broiler chickens as affected by carcass pretreatment and γ-irradiation.** *Journal of Food Science* 57(2): 1992: 330-332

γ-irradiation of freshly processed chicken carcasses at 2.5 kGy delayed microbial growth resulting in extended shelf-life and reduced the initial loads of *Yersinia* and *Campylobacter*. The counts remained lower in irradiated samples than in unirradiated samples stored for 18 days at 4 C. Salmonellae incidence was completely eliminated by irradiation. Thermophilus whey treatment of chicken carcasses reduced the incidence of salmonellae (67% to 20%) on chicken carcasses compared to controls. Combination treatment with thermophilus whey and irradiation was no more effective than treatment with irradiation alone. As evidenced by the bacterial counts the shelf-life was found to be 15 days for irradiated carcasses compared to about 6 days for the unirradiated samples. SRA

Broilers

1241

Kukde (RJ), Thakur (BS) and Deshmukh (AD). **Organolepsis of meat of broilers fed on various bio-stimulators.** *Poultry Guide* 29(2): 1992: 39-41

Broilers of 150-day old were fed with biostimulators prepared from goat testicles, broiler testicles and chick embryo. The meat quality of biostimulator fed broilers (BFB) was tested at 8 wk of age. The sensory test was repeated in rainy, winter and summer seasons. The acceptability of meat of the BFB was found to be better than the control. However, season did not influence the acceptability of BFB chicken meat. GS

Turkeys

1242

Daum-Thunberg (DL), Foegeding (EA) and Ball (HRJr). **Rheological and water-holding properties of comminuted turkey breast and thigh: Effects of initial pH.** *Journal of Food Science* 57(2): 1992: 333-337

Results indicated that thigh meat gels (pH 6.4) had higher cooking yield, held-water, shear stress and shear strain at failure than breast meat gels (pH 5.9). Functional properties of breast meat adjusted to pH 6.4 during chopping were similar to those of thigh, whereas thigh adjusted to pH 5.9 remained different from breast. Rheological properties of breast meat gels did not increase when pH was adjusted by dialysis, suggesting that pH during chopping is important to rheological properties. SRA

1243

Chambers (EIV), Bowers (JR) and Smith (EA). **Flavour of cooked, ground turkey patties with added sodium tripolyphosphate as perceived by sensory panels with differing phosphate sensitivity.** *Journal of Food Science* 57(2): 1992: 521-523

The addition of 0.4% sodium tripolyphosphates (STPP) altered the flavour profile for ground turkey. Flavour profiles indicated that turkey patties without STPP had more intense protein, sevumy, brothy and metallic character and less intense turkey and soapy character than the samples with phosphate. Both panels found similar characteristics for turkey with added phosphate, although the characteristics had slightly different order of appearance. The panel with a lower threshold for STPP found a more intense soapy character that tended to linger in the phosphate-treated samples. SRA

Products

1244

Mahapatra (CM). **Poultry products technology.** *Poultry Guide* 29(2): 1992: 69-70

Eggs

1245

Van Elswyk (ME), Sams (AR) and Hargis (PS). **Composition, functionality and sensory evaluation of eggs from hens fed dietary menhaden oil.** *Journal of Food Science* 57(2): 1992: 342-344, 349

1246

Singh (RP) and Panda (B). **Effect of modified atmosphere packaging on the keeping quality of pickled quail eggs.** *Indian Food Packer* 45(6): 1991: 12-15

The efficacy of vacuum packaging and N gas flushing on the storage life of pickled quail eggs at ambient storage (18 - 38 C, 36 - 84% RH) for 9 months was studied. Cooked and peeled eggs were dipped in a

pickling solution containing 50% vinegar, 8% common salt, 0.02% tartrazine and 2% each spice mixture, minced garlic and ginger for 48 h and packaged in flexible PFP (12 µm polyester/90 µm Al foil/38 µm LDPE) laminated pouches of internal dimensions 12. x 10 cm with or without vacuum or flushed with N gas. The pickled eggs showed neglible wt. loss and slight fluctuation in their equilibrated pH (4.26) value during the storage period. The study showed that vacuum or N gas packaging of pickled quail eggs in O_2 and water impermeable PFP laminate protected from lipid autoxidation and dehydration and extended the shelf-life for 8 months as against 4 months for the control. GS

1247

Raikhy (J) and Bawa (AS). **Tartaric acid pickling of chicken eggs.** *Research and Industry, India* 37(1): 1992: 49-53

Hard cooked, cooled eggs were peeled and immersed in 1, 3, 5 and 6% tartaric acid solution in jars kept at ambient (20 - 25 C) and refrigeration (7 C) temp. till pH equilibrium was attained. The changes in pH, acidity, protein and moisture content was determined. The pH of egg yolk and white gradually increased while the acidity of the pickling solution decreased during the equilibration period of 8 - 10 days. Sensory evaluation indicated that 3% tartaric acid solution was most favourable for pickling chicken egg. GS

1248

Panda (PC), Khaterpal (N) and Nita Khanna. **Eggs for making cake.** *Poultry Guide* 29(2): 1991: 53-57

SEAFOODS

1249

Miletic (I), Miric (M), Lalic (Z) and Sobajic (S). **Composition of lipids and proteins of several species of molluscs, marine and terrestrial, from the Adriatic sea and Serbia.** *Food Chemistry* 41(3): 1991: 303-308

1250

Jayasekaran (G) and Seetharama Shetty (T). **Extrusion technology for seafood industries.** *Seafood Export Journal* 24(1): 1992: 11-13, 15-18

The possibility of adopting extrusion technology for producing value added surimi based seafood products from by-catch is described. Method of surimi production, the products that could be prepared from surimi, and the future prospects for these products are indicated. SRA

Crabs

1251

Gates (KW) and Parker (AH). **Characterization of minced meat extracted from blue crab picking plant by-products.** *Journal of Food Science* 57(2): 1992: 267-270, 292

Mechanically extracted Blue crab meat from picking-room by products to produce the minced meat yields as the percentage of uncooked crab wt. were: white meat 3.18%; mixed minced meat 13.89%; minced leg 2.62%; and minced claw 6.39%. Total recoverable minced meat was approx. 2.2% of an uncooked crab. Each meat had distinct visual, textural and flavour attributes. Microbial levels ranged from 10^5 to 10^7 CFU/g. Pasteurization at 83.3 C reduced plate counts to less than 3×10^3 CFU/g ($P < 0.05$). Extraction within 1.5 h of picking or icing of by-products prior to mechanical extraction stabilized microbial levels. Addition of citric acid-phosphite buster to meat pasteurized at 80.6 C reduced darkening of meats. SRA

Jellyfish

1252

Kimura (H), Mizuno (H), Saito (T), Suyama (Y), Ogawa (H), Iso (N). **Structural change of salted jellyfish during cooking.** *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 57(1): 1991: 85-90

Salted jellyfish are eaten after desalting in water, boiling, and dipping in water for several days. In this work, the structural change of salted jellyfish during the process described above has been studied by observation with a scanning electron microscope and with ordinary microscopes. The samples became shortened in the direction along the surface of the skin by boiling at 80 C for 30 min, so that the thickness which was perpendicular to the surface increased. The change is due to the shrinkage of collagen in a part of the umbrella of the jellyfish by heating, which is ascertained by the stain method and differential scanning calorimetrical measurement. A network structure was observed on the surface of the heated sample. The network structure of the heated sample was destroyed after dipping in water for 6 days. Also, the surface of both the unheated and heated sample was peeled by dipping in water, and the change was larger in the heated one. Not only the thermal denaturation of collagen but these structural changes may contribute to the texture of cooked jellyfish. AS

Mussels

1253

Gore (PS), Raveendran (O), Iyer (TSG), Verma (PGR) and Sankaranarayanan (VN). **Bacterial contamination of mussels at Mahe estuary, Malabar coast.** *Fishery Technology* 29(1): 1992: 57-61

The bacterial quality of beach sand, water, sediment from Mahe estuary, mussels from mussel bed and market were studied during monsoon and post-monsoon months. Results showed presence of *Escherchia coli*, faecal streptococci and total coliforms in samples. High incidence of both bacterias were recorded during monsoon, low incidence of post-monsoon, and lowest in pre-monsoon months. Pathogens like *Salmonella* and *Vibrio cholerae* non 01 were isolated from the mussel samples. The sewage and land drainage of the region contribute to the contamination of the environment. SRA

Prawns

1254

Gupta (SS) and Subrata Basu. **Studies on individually quick frozen and block frozen prawns.** *Fishery Technology* 29(1): 1992: 80-81

The quality of individually frozen-prawns was compared with block frozen prawns (-40 C) in contact plate freezer. Analysis showed that α-amino N, salt soluble protein, moisture and total bacterial count decreased while total volatile base nitrogen increased in individually and block frozen-prawns during storage. The differences in the values of these samples were not significant ($P > 0.05$). No difference was detected in the sensory quality of the prawns during 22 wk storage and it is concluded that the quality of individually quick frozen-prawns were no way better than the block frozen-prawns. SRA

1255

Ariyani (F) and Buckle (A). **Ensiling of prawn heads.** *ASEAN Food Journal* 6(2): 1991: 58-63

The effect of mineral and organic acids on prawn heads and the proportion of acids to prawn waste to produce a stable silage has been examined during 10 wks storage at 25 - 30 C. The study indicated that either organic acids (e.g. formic acid, propionic acid) or mixtures of organic acid mineral acid (e.g. formic acid, sulphuric acid) can produce a stable prawn head silage, although the solubility of prawn head protein (upto 60%) is less than that obtained with fish protein under similar conditions. A rapid solubilisation of prawn head protein and decrease in viscosity was observed during the first wk of storage and slower changes in subsequent wks. The best prawn head silage, with respect to pigment stability, solubilization and stability during storage was produced with 1:1 (v/v) combination of propionic acid and formic acid. 8% acid is recommended to ensure preservation, especially for longer storage times. AS

Shrimps

1256

Chen (H-C), Ho (W-L), Moody (MW) and Jiang (S-T). **Modification of *Cellulomonas flavigena* NTOU 1 characteristics for the production of shrimp hydrolysates.** *Journal of Food Science* 57(2): 1992: 271-276

Squids

1257

Ke (PJ), Fierheller (M) and Lemon (DW). **Studies on processing technology for Atlantic short-fin squid (*Illex illecebrosus*).** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 328-333

Various squid processing and utilization techniques have been investigated and evaluated. The innovated and improved processing technology has been developed in our lab. and recommended to be employed successfully for Atlantic short-fin squid (*Illex illecebrosus*). With the recommended chilling and handling operations, the fresh squid can be held for more than 4 days at Grade A with proposed physical and chemical guidelines. The techniques for freezing, thawing and skinning have been also described and compared. Various drying operations for producing dried squid and seasoned half-dried squid have been developed and recommended for Canadian squid fisheries. With various quality enhancement operations, squid resources can be effectively utilized to give certain value-added products. AS

Fish

1258

Montero (P) and Borderias (J). **Emulsifying capacity of collagenous material from the muscle and skin of hake (*Merluceius merluceius* L.) and trout (*Salmo irideus* Gibb): Effect of pH and NaCl concentration.** *Food Chemistry* 41(3): 1991: 251-267

1259

Nettleton (JA) and Exler (J). **Nutrients in wild and farmed fish and shellfish.** *Journal of Food Science* 57(2): 1992: 257-260

1260

Baldwin (J), Wells (RMG), Low (M) and Ryder (JM). **Tauropine and D-lactate as metabolic stress indicators during transport and storage of live paua, (New Zealand abalone) (*Haliotis iris*)** *Journal of Food Science* 57(2): 1992: 280-282

1261

Ajuyah (AO), Hardin (RT), Cheung (K) and Sim (JS). **Yield, lipid, cholesterol and fatty acid composition of spent hens fed full-fat oil seeds and fish meal diets.** *Journal of Food Science* 57(2): 1992: 338-341

1262

Joseph (J), George (C) and Perigreen (PA). **Effect of spices on improving the stability of frozen stored fish mince.** *Fishery Technology* 29(1): 1992: 30-34

The effectiveness of clove, cinnamon and pepper at 0.05, 0.10 and 0.20% level in extending the shelf-life of minced fish during frozen storage (-20 C) for 50 wk was investigated. It was observed that clove showed a strong antioxidant effect. Frozen storage stability increased with increase in spice concn.; but concn. > 0.2% was not appreciated by taste panel. The thiobarbituric acid value was not consistent in samples incorporated with cinnamon and pepper but clove gave good stability and effectively retarded the flavour deterioration. It was concluded that clove at 0.05% level enhanced the storage stability and acceptability for about 28 wk, but for storage upto 50 wk incorporation at 0.1% level was necessary. SRA

1263

Behanan (L), Mathew (S), Sudharma (D), Mukundan (MK) and Malika (V). **Effect of fruit juices with acetic acid on the quality and storage stability of pickled fish.** *Fishery Technology* 29(1): 1992: 40-44

Fish pickles with juices from tamarind, lime and gooseberry and acetic acid was compared with acetic acid alone for quality and shelf-life. Cut pieces of fish Pulli Kalava (*Epinephelus* spp.) was fried and mixed with tamarind, lime and gooseberry juices and vinegar in 1:1 ratio. Experimental samples contained 200 ml each of fruit juice and acetic acid while the control pickle contained 400 ml acetic acid. They were left to mature for 2 days and packed in bottles and stored for 6 months at room temp. Sensory, bacteriological and chemical analysis were done every month. Results showed that all samples remained good throughout the storage period. Tamarind juice with acetic acid added pickles were superior to other pickles in colour, taste and texture. Gooseberry juice and acetic acid added pickle was poor and unacceptable. SRA

1264

Sankar (TV) and Solanki (KK). **Changes in nitrogen fractions in the fillets of elasmobranchs during salting.** *Fishery Technology* 29(1): 1992: 45-47

Skinless fillets of shark (*Scoliodon* spp.) and ray fish (*Trigon* spp.) were immersed in saturated brine at 27 - 30 C. The brine was changed initially after 4 h and then after every 12 h. Samples were analysed at 4 h intervals upto 72 h for moisture, salt, total N and non-protein nitrogen (NPN). The loss of moisture, NPN and soluble protein nitrogen was rapid in the first 8 h followed by slower decrease for both shark and ray fish fillets. The losses were proportional to the salt uptake. SRA

1265

Mathen (C), Unnikrishnan Nair (TS) and Ravindranathan Nair (P). **Effect of some vegetable oils on insect infestation during storage of dry cured fish.** *Fishery Technology* 29(1): 1992: 48-52

Gingelly oil, sunflower oil, safflower oil, palm oil, rice bran oil, castor seed oil, mustard oil, groundnut oil, hydnocarpus oil, neem oil, coconut oil and cashewnut shell liquid were used to find out their insect repellancy in dried fish. Commercially dry cured silver belly fish after drying with moisture content of 27.4 - 38.3% was used. Each oil was sprayed on dry gunny bag and on the fish; unsprayed fish in untreated gunny bag was kept as control. The bags were stored at ambient condition and insect infestation was determined at regular intervals. Gingelly oil, mustard oil, sunflower oil, and hydnocarpus oil showed good insect repellency and delayed the infestation of dry cured fish. SRA

1266

Abraham (TJ), Sugumar (G), Sukumar (D) and Jayachandran (P). **Bacterial profile of fresh and spoiled fish mince from *Johnius dussumieri* at refrigerated storage.** *Fishery Technology* 29(1): 1992: 53-56

The % composition of bacterial flora varied in fresh fish, fresh mince and spoiled mince. Filleting, chopping and washing increased the bacterial count by more than one log unit. Initial total plate count (TPC) and proteolytic count (PC) of fish mince were 3.60×10^6 and 1.0×10^4/g respectively. Proteolytic count increased to 2.60×10^5/g in 24 h. In 11 days at 4 plus or minus 1 C, the TPC and PC increased to 6.05×10^9 and 4.10×10^9/g, an increase of > 3.0

and 5.0 log units, respectively. Trimethyl amine nitrogen increased from 1.38 mg/100 g to 5.51 mg/100 g in one day storage. Total volatile base nitrogen increased to 31.79 mg/100 g in 5 days storage. However, fish mince showed no spoilage up to 5 days at 4 plus or minus 1 C. *Acinetobacter* and *Aeromonas* were dominant in fresh fish which decreased drastically upon mincing, washing and storage. In fresh mince 71% of the bacteria were Gram positive of which micrococcus was dominant. In spoiled mince 80% were Gram negative comprising mainly of *Vibrio* and *Pseudomonas*. SRA

1267

Subrata Basu, Gupta (SS) and Kesavan Nair (AK). **Control of blow fly larvae infestation in cured fish.** *Fishery Technology* 29(1): 1992: 82-83

Attempt was made to control infestation of blow fly larvae by controlling moisture and salt concn. in cured fish. Sciaenid fish were gutted, split open, washed, dry salted and sun-dried for 2 - 3 days. Samples were collected at regular intervals and examined for the growth of larvae. Results were statistically analysed to find a correlation between moisture and salt content in cured fish necessary to eliminate blow fly larvae. The mositure content varied between 15.7 and 61.6% and the salt content varied from 4.2 to 22.4%. The points corresponding to non-infested and infested samples were found to form two separate sets with well-specified border line, which is represented by equation, salt % = 0.335 (moisture %) - 0.768. This could be further simplified as salt (%) greater than or equal to 0.335 (moisture %). These definitions hold good for moisture range of 34.4 to 52.4% and salt range of 11.8 to 22.4%. SRA

1268

Mannino (S), Granata (A) and Fregapane (G). **Determination of mercury in fish muscle by square wave voltammetry.** *Italian Journal of Food Science* 2(2): 1990: 97-101

A rapid and simple method based on Square Wave Voltammetry, has been developed for the detn. of mercury in fish samples. After decomposition of the organic material by wet ashing in a High Pressure Asher, the sample is diluted and then transferred to the electrochemical cell using glassy carbon as the working electrode. Under the experimental conditions adopted the detection limit (signal/noise = 3) is 1 p.p.b. and the relative standard deviation for 9 detn. at 2.0 p.p.m. level is 4.5%. Results obtained on 10 commercial samples of fish are reported. AS

1269

Rehbein (H) and Orlick (B). **Comparison of the contribution of formaldehyde and lipid oxidation products to protein denaturation and texture deterioration during frozen storage of minced ice-fish fillets. *Champsocephalus gunnari* and *Pseudochaenichthys georgianus*.** *International Journal of Refrigeration* 13(5): 1990: 336-341

Fillets of the ice-fish *Champsocephalus gunnari* and *Pseudochaenichthys georgianus* were minced and mixed with various additives to induce the formation of formaldehyde and oxidation of lipids. The mixtures were frozen and stored for several months and protein denaturation and changes in texture were measured. Samples containing high concn. of formaldehyde were very tough in texture. However it was found that even severe lipid oxidation (up to 14 mg of malonaldehyde per kg wet mass) had only a slight influence on texture. AS

Alaska pollack

1270

Konno (K). **Supression of thermal denaturation of myosin subfragment-1 of Alaska pollack (*Theragra chalcogramma*) by sorbitol and accelerated inactivation by pyrophosphate.** *Journal of Food Science* 57(2): 1992: 261-264

Croakers

1271

Lakshminatha Reddy, Setty (TMR) and Dora (KC). **Studies on the storage behaviour of frozen fish fingers from croaker and perches.** *Fishery Technology* 29(1): 1992: 35-39

The battered and breaded fish fingers from croaker (*Sciaenid*) and pink perch (*Nemipterus japonicus*) meat were prepared and stored for 22 wk at -20 C. Total volatile base N (TVBN), peroxide value (PV), thiobarituric acid value (TBA), free fatty acids (FFA) were determined at monthly intervals. Aerobic plate count, mesophilic spore forming aerobes, enteropathogenic *E. coli*, *Salmonella vibrio* and *Staphylococcus aureus* were determined. The sensory qualities were assessed after frying fish fingers (180 - 200 C) for 2 min. Results showed a gradual increase in TVBN in croaker and pink perch during storage. In both samples PV increased in first 2 wk and decreased gradually. There was gradual increase in TBA upto 14 wk, FFAs increased up to 6th wk. Bacterial counts in both the fish fingers decreased throughout the storage. Food poisoning organisms were not detected. The taste panel preferred pink perch than croaker. The quality of fish fingers decreased slightly in both the samples during 22 wk storage. SRA

Red hake

1272

Owusu-Ansah (YJ) and Hultin (HO). **Differential insolubilization of red hake muscle proteins during frozen storage.** *Journal of Food Science* 57(2): 1992: 265-266

Sardines

1273

Nakayama (T), Oka (T) and Ooi (A). **Several technical factors affecting the texture of reconstructed sardine meat.** *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 57(1): 1991: 91-98

Reconstructed sardine meat was prepared from a mixture of sardine mince and sodium alginate by the aid of dialysis with respect to $CaCl_2$ solution. A soft consistency was preferred to match with Western style dishes. The effect of NaCl or $MgCl_2$ included in the $CaCl_2$ solution and the effect of enzyme treatment of sardine mince were investigated to obtain a soft consistency. When the NaCl concn. was more than 0.1 m, the jelly strength became remarkably smaller than that at 0.00 M NaCl. As the NaCl concn. increased, breaking deformation increased at the early stage of dialysis. A suitable soft consistency was obtained by 0.1 M NaCl and 48 h dialysis. The jelly strength at 0.004 M $MgCl_2$ was remarkably smaller than that at 0.000 M $MgCl_2$. As the $MgCl_2$ concn. increased, breaking deformation increased at the early stage of dialysis, but decreased at the late stage. A moderate consistency was obtained by 0.016 M $MgCl_2$ and 48 h dialysis but was unacceptable due to other attributes. As the enzyme concn. increased, the jelly strength increased at the early stage of dialysis, but decreased at the late stage and as the enzyme concn. increased, breaking deformation increased, and max. breaking deformation was observed when enzyme concn. was 0.5%. When the time for enzyme treatment was increased, the jelly strength and breaking deformation increased once and then decreased, and the max. jelly strength and breaking deformation were observed when the time for enzyme treatment was 30 min. A suitable soft consistency was obtained by enzyme treatment for 30 min at 0.5% enzyme and 48 h dialysis. AS

1274

Tanaka (M), Xueyi (Z), Nagashima (Y) and Taguchi (T). **Effect of high pressure on the lipid oxidation in sardine meat.** *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 57(5): 1991: 957-963

The model systems consisting of sardine lipids and defatted meat were prepared and pressurized at 1,800 atm. After the pressure was released, the model systems were stored at 5 C. The effect of high pressure treatment on the oxidation of sardine lipids during storage was evaluated by using such oxidation indices as peroxide value, TBA number, oxygen absorption, UV absorption, browning and fluorescence. It was revealed that the oxidation of sardine lipids was accelerated by the pressure treatment and its extent was relative to intensity and duration of the treatment. In the model system prepared with sardine meat washed with water, the rate of lipid oxidation decreased and was fairly related to the amount of heme iron. When the water content of model system was altered, the oxidation rates of sardine lipids were > 7% > 35% > 24% > 17%. At 17 and 24% water contents, no appreciable oxidation proceeded during the storage of 4 days. On the other hand, at higher water contents the oxidation rate of sardine lipids in the pressurized model system was lower than that in the unpressurized system. AS

Tilapia

1275

Jiang (S-T), Wang (Y-T) and Chen (C-S). **Lysosomal enzyme effects on the postmortem changes in tilapia (*Tilapia nilotica X T. aurea*) muscle myofibrils.** *Journal of Food Science* 57(2): 1992: 277-279, 282

To investigate the effects of lysosomal proteases on myofibril fragmentation, tilapia (*Tilapia nilotica X T. aureau*) muscle myofibrils were incubated with isolated lysosomal fraction containing 12 units of cathepsin D/ml (G-II) and pure cathepsin D (12 units/mL G-III) at pH 5.5, 6.0 and 6.5 for 3 days at 4 C. Among samples incubated at pH 5.5, the degree of myofibril fragmentation (DMF) of G-III was highest, while, at pH 6.0 and 6.5, that of G-I suggested that cathepsin D still had proteolytic activity on myofibrils. Difference in the decrease of protein content between G-III and G-I, and between G-II and G-I indicated that proteolysis caused by cathepsin D was highest at pH 5.5, while that caused by lysosomal enzymes was highest at pH 6.5. This suggested the participation of lysosomal enzymes in the fragmentation of myofibrils. AS

Products

1276

Iso (N), Mixuno (H), Ogawa (H), Mochizuki (Y) and Masuda (N). **Differential scanning calorimetry on fish meat paste.** *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 57(2): 1991: 337-340

The thermal measurements using a differential scanning calorimeter was done with 10 kinds of fish meat, cuttlefish meat paste and chicken meat paste. The total enthalpy change, ΔH, accompained with the thermal gelation of meat pastes were estimated. Consequently, it was found that the easy-setting meat and the easy-disintegrating meat required a small quantity of heat in order to change the structure. The setting index (S) and the disintegration index (D) depends on the ΔH-values as $\Delta H = -0.0074S + 1.047$; $\Delta H = -0.0038D + 0.783$. The easy setting property or the easy-disintegrating property corresponds to the fact that these meat pastes are easily changed by a small quantity of heat. On the other hand, the correlation could not be found between ΔH and the gel-strength. AS

PROTEIN FOODS

Nil

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

1277

Maughan (RJ). **Development and efficacy of carbohydrate-electrolyte sports drinks.** *Trends in Food Science and Technology* 2(7): 1991: 162-165

This feature examines some of the evidence that provide the physiological rationale for the formulation of carbohydrate-electrolyte products currently sold as sport drinks, and reviews studies that have investigated the effectiveness of such products in improving exercise performance. Aspects covered are: fatigue in prolonged excercise, effects of ingesting carbohydrate-electrolyte solutions during exercise, availability of ingested fluids, and composition of sports drinks. 19 references. BV

1278

Chapman (JW). **The development and use of novel yeast strains for food and drink manufacture.** *Trends in Food Science and Technology* 2(7): 1991: 176-180

This review covers classical yeast genetics, 'Neo-classical' yeast genetics development of recombinant DNA techniques, homologous gene expression and heterologous gene expression. 34 references. BV

Alcoholic beverages

Beer

1279

van Waesberghe and Ir (JWM). **Practical investigations on the possible impact of mash separation time on beer flavour and its flavour stability influence of the husk fraction.** *Technical Quarterly, Master Brewers Association of America* 28(1): 1991: 33-37

As part of a long-term research project to improve flavour stability of pale lager beers, this paper discusses the effect of husk material on beer flavour and flavour stability in relation to malt adjunct ratios, maceration time and husk fractionation. It appears that shortest contact time during mash separation and sparging helps in lowering the TBA values of cold wort and consequently in beer under comparable circumstances of fermentation. As far as verification trials could be done, that is positive in view of flavour stability. AS

Wines

1280

Pardo (I) and Zuniga (M). **Lactic acid bacteria in Spanish red rose and white musts and wines under cellar conditions.** *Journal of Food Science* 57(2): 1992: 392-395, 405

1281

Belleville (M-P), Brillouet (J-M), Tarodo De La Fuente (B) and Moutounet (M). **Fouling colloids during microporous alumina membrane filtration of wine.** *Journal of Food Science* 57(2): 1992: 396-400

Three different wines, from the same cv., were microfiltered using a device operating under static conditions and equipped with a section of monochannelled tubular alumina membrane, pore size 0.2 μm. Filtration flux curves resembled a permeation profiles observed in dynamic cross-flow conditions using a similar membrane. Minute amounts of colloidal material deposited on the surface and inside the membrane were isolated for the first time and characterized as mixtures of high mol. wt. moderately acidic grape proteoglycans (surface deposit) and low mol. wt. acidic moieties (inner deposit). These fouling colloids were likely deposited by trace amounts not detectable in crude starting wines. AS

1282

Sacchi (R), Maione (V), Giudicianni (I), Nota (G), Paolillo (L), Addeo (F). **The determination of methanol in wines by proton NMR spectroscopy.** *Italian Journal of Food Science* 2(2): 1990: 113-122

A quantitative evaluation of methanol in wines was carried out using proton nuclear magnetic resonance (1H-NMR) spectroscopy, with high field magnets. The methanol peak intensity was compared to that of the 13C-satellite of the ethanol methylene quartet allowing a rapid and direct estimation of the methanol content in wine. These results were compared with those obtained from colorimetric and GC analysis. Nuclear magnetic resonance and GC results were in excellent agreement. The 1H-NMR method, however, has the advantage of being more rapid and nondestructive. AS

Musts

1283

Clementi (F). **Fluidbed dried immobilized cells of *Lactobacillus casei* used for L-malic acid degradation in must.** *Italian Journal of Food Science* 2(1): 1990: 25-34

The effects of fluidbed-drying and freeze-drying of polyacrylamide entrapped malolactic bacteria to be used for malic acid degradation in wine-making were compared. Fluidbed-drying was most effective because the activity of the dried beads was similar to the untreated ones. Regardless of drying temp. (from 30 to 45 C, for different durations), the rehydrated entrapped cells completely degraded L-malic acid in must (4.8 g/l), during incubation at 10 C for 20 h: they were rather stable during 15 days of repeated batch operations. The drying kinetics were determined at 35 C for 120 min, to an a_w value of 0.66. The diffusion of L-malic acid into gel remained unchanged after drying and rehydrating of the beads. AS

Non-alcoholic beverages

Coffee

1284

Clarke (RJ). **The volatile compounds of roasted coffee.** *Italian Journal of Food Science* 2(2): 1990: 79-88

About 700 different volatile compounds have now been identified in roasted coffee. Many of these compounds contribute directly to the flavour/aroma of the prepared coffee beverages, and to the aroma arising from the dry product. A number of these have been quantified in roasted coffee with some additional data relevant to actual level of roast. These compounds fall into a number of structural categories, of which various heterocyclic groups are important. It is particularly emphasized that information is lacking on a number of relevant physical properties for many of these compounds. This information would be desirable in assessing behaviour during instant coffee processing. AS

1285

Massini (R), Nicoli (MC), Cassara (A) and Lerici (CR). **Study on physical and physico-chemical changes of coffee beans during roasting.** *Italian Journal of Food Science* 2(2): 1990: 123-130

The structural changes in green coffee beans which occur during roasting were studied using scanning electron microscopic analysis. The structure of the green coffee bean appeared homogenous, while the production of water vapour, CO_2 and other volatile compounds caused the formation of cavities and surface fractures during roasting. For dark roasting processes, as with Italian roasting, the progressive carbonization of the bean causes a lowering of the retention capacity of the volatile compounds. The release of CO_2 and the change of the pH were shown to by closely related to the observed structural changes of the bean. AS

Fruit juice

1286

de Oca (CM), Gerschenson (LN) and Alzamora (SM). **Effect of the addition of fruit juices on water activity of sucrose-containing model systems during storage.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 375-377

The addition of fruit juices (pineapple, apple, pear, plum and peach juices) to stored sucrose-containing model systems accelerated the lowering of a_w due to the catalytic effect on the rate of sucrose hydrolysis. BV

1287

Ozilgen (M), Durukan (A) and Ulgen (N). **Enthalpy-entropy and frequency factor-activation energy compensation relations for microbial death in fruit juices.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 378-381

Thermal death kinetics of *leuconostoc mesenteroides* and *Bacillus coagulans* were studied experimentally in pH adjusted orange juice and glucose or sucrose added apple juice, respectively. The frequency factor and the activation energy of these processes were calculated by using the Arrhenius expression. The activation entropy and the activation enthalpy were calculated with the analogy between the unimolecular chemical reaction and the microbial death kinetics by using Eyring's theory. No trends were observed in variation of the kinetic parameters

with the pH values or the sugar concn., but these functions agreed with the kinetic compensation relations. Analysis of the data indicated that there was no actual isokinetic temp. for the family of related experiments, indicating that the thermal death kinetics of *L. mesenteroides* and *B. coagulans* have different mechanisms under varying conditions. AS

Apple juice

1288

Lozano (JE). **Kinetics of non-enzymatic browning in model systems simulating clarified apple juice.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 355-360

Model food systems containing sugars, organic acids and amino acids asparagine, aspartic and glutamic acids, considered to be the major clarified apple juice components, were used to study non-enzymatic browning (NEB). The model solutions were prepared to 50, 60 and 70°Brix, and stored at temp. ranging from 15 to 37 C. Colour, pH, acidity and 5-hydroxymethylfurfural (5-HMF) formation were determined periodically over 180 days. Results indicated an apparent zero-order reaction rate with an induction period. Calculated activation energies for NEB and 5-HMF formation were approx. 35 Kcal/mole. Major components affected the NEB rate in the following order: amino acids > reducing/total sugars > fructose/glucose > malic acid. AS

Banana juice

1289

Koffi (EK), Sims (CA) and Bates (RP). **Viscosity reduction and prevention of browning in the preparation of clarified banana juice.** *Journal of Food Quality* 14(3): 1991: 209-218

Pectinase, cellulase and hemicellulase combination was more effective in reducing viscosity and improving filterability of green and ripe banana purees than pectinase and galactomannase or cellulase combination after 3, 6 and 9 h incubation. α-amylase was not effective but potassium metabisulphite (100 mg/l) and produced a stable light colour juice than two heating methods (heating whole, unpeeled bananas at 100 C for 11 min; heating puree at 80 C for 1 - 2 min) and ascorbic acid (470 mg/l). Clarified juices treated with ascorbic acid and control darkened due to polyphenoloxidase activity. Flavour intensity of juices by sensory analysis was not significantly different. SD

Blackberry juice

1290

Rommel (A), Wrolstad (RE) and Heatherbell (DA). **Blackberry juice and wine: Processing and storage effects on anthocyanin composition, colour and appearance.** *Journal of Food Science* 57(2): 1992: 385-391, 410

Blackberry wine was made from thawed fruit (Evergreen var.) by fermentation of pulp, depectinized juice, and high-temp. short time (HTST)-treated and depectinized juice. The effects of fining and storage on pigment composition, colour and appearance were investigated. Seven anthocyanin pigments (cyanidin-3-glucoside, cyanidin-3-rutinoside, a xylose-cyanidin derivative, two acylated cyanidin derivatives, cyanidin and a polymeric derivative) were detected in the juices and wines by HPLC. Cyanidin-3-glucoside was highly unstable during fermentation. Haze development and sediment formation occurred, and 85 to 100% of total anthocyanins degraded. Blackberry juice that had been HTST-pasteurized, depectinized and fined produced wine with the most stable colour and best appearance after storage. AS

Grapefruit juice

1291

Fellers (PJ). **The relationship between the ratio of degree brix to percent acid and sensory flavour in grapefruit juice.** *Food Technology* 45(7): 1991: 68, 70, 72-75

This article reviews the effect that ratio has on flavour quality or consumer acceptance. The results of several taste panel studies evaluating processed grapefruit juice products is discussed and the correlation between ratio and flavour examined. 19 references. CSA

Orange juice

1292

Couture (R) and Rouseff (R). **Debittering and deacidifying sour orange (*Citrus aurantium*) juice using neutral and anion exchange resins.** *Journal of Food Science* 57(2): 1992: 380-384

The initial compositions of Seville, Bigaradier and Sour cv. used for deacidification using IRA-93 resins, and bitter sweet treated with IRA-93 and XAD-16 resin improved the palatability of sour orange juice. Average acidity was reduced from 57 - 87% using IRA-93 before depletion. Naringin concn. were reduced 50 - 66% in high acid juice and 89% in low acid juice using IRA-93. Under similar

conditions 24 - 30% of limonin was eliminated using IRA-93 and essentially 100% removed using XAD-16. SRA

Papaya juice

1293

Gray (J) and Mower (HF). **The role of simple carbohydrates in the supression of hydroxyl free radicals in γ-irradiated papaya juice.** *Food Chemistry* 41(3): 1991: 293-301

Hydroxyl free radical ($HO^{\cdot}$), reactions with trapping agents (e.g. 2-hydroxytribose, 2-hydroxybenzoic acid, dimethylpyrroline N-oxide) are blocked when diluted papaya juice is added to irradiated mixtures prior to exposure to ^{60}CO γ-rays. The study of these agents showed that glucose, fructose and sucrose present in juice in total concn. of 0.5 - 0.7 molar, block $HO^{\cdot}$ reactions producing malonaldehyde and other sugar derivatives. Heat treatment of fruit inactivates sequestered invertase enzyme in the juice and juice contains lower quantities of simple sugars to be a poorer quenching agent than unheated juice. Synthetic mixtures of simple sugars to compensate the level mimic the inhibition of $HO^{\cdot}$ and the production of malonaldehyde. SD

Pineapple juice

1294

Ramteke (RS) and Eipeson (WE). **Studies on concentration of pineapple juice - Evaluation of suitability of different types of evaporators.** *Indian Food Packer* 45(6): 1991: 7-11

A comparative assessment of forced circulation, falling film and plate evaporators, for the concn. of pineapple juice, was made. The concentrates were evaluated for colour, aroma retention after converting into ready-to-serve beverages, as (i) concentrates (ii) cut back concentrates and (iii) aroma added back concentrates. The aroma loss and browning intensity were max. in forced circulation evaporator, followed by plate and falling film evaporators. Aroma did not differ significantly among the 3 concentrates prepared in the three evaporators. SRA

FATS AND OILS

Oils

1295

Yen (G-C). **Thermal stability of sesame/soybean oil blends.** *Food Chemistry* 41(3): 1991: 355-360

Dielectric constant, viscosity, refractive index and absorbance at 232 nm determined on soybean oil, roasted/unroasted sesame oils and sesame/soybean oil blend showed that both roasted/unroasted sesame oils had greater thermal stability than soybean oil whose thermal stability increased after 48 h heating and blending with 20% unroasted sesame oil. SD

Canola oils

1296

Temelli (F). **Extraction of triglycerides and phospholipids from canola with supercritical carbon dioxide and ethanol.** *Journal of Food Science* 57(2): 1992: 440-442, 457

Phospholipids used as emulsifiers were sparingly soluble in supercritical CO_2 (SC-CO_2), but could be recovered with the addition of ethanol as an entrainer. Triglycerides and lipids containing phospholipids were extracted with SC-CO_2 in two subsequent steps from both canola flakes and press cake containing 0 and 5% ethanol, respectively. 70 C, 62.0 MPa and addition of ethanol at an initial level of 5% gave max. yield of lipids. TLC showed the presence of phospholipids in SC-CO_2-ethanol extracts. SC-CO_2 extracts of flakes did not contain long chain fatty acids (C20:0, C22:0, C22:1), but they were extracted when ethanol was added to flakes and when press cake was the raw material. AS

Palm oils

1297

Chong (CN), Wang (CW), Hoh (YM) and Ori (CK). **1,3-Regiospecific lipolytic modification of palm oil fractions.** *ASEAN Food Journal* 6(2): 1991: 69-73

This paper presents the findings of the enzymatic interesterification (acidolysis) of three palm oil fractions (palm oil, palm stearin and palm olein) with stearic acid by the 1,3-specific Novo immobilized lipase lipozyme (IMZO) with the view of producing a cocoa butter equivalent. Investigation showed that various biomodified palm oil fractions had triglyceride fatty acyl and total carbon number profiles comparable to that of cocoa butter. The analysis of triglyceride compositions by HPLC indicated that overall, their palmitic-oleic-palmitic (POP), palmitic-oleic-stearic (POS) and stearic-oleic-stearic (SOS) components were low at 12.2, 20.1 and 9.9% as against 18.4, 44.4 and 30.8% for cocoa butter, respectively. A very substantial incorporation of stearic acid was effected by the 1,3-specific lipase-catalysed interesterfication reaction resulting in the formation of 40 - 50% of

these desirable triglycerides, whose relative compositions were comparable to that of cocoa butter. These biomodified palm oil fractions could serve as sources of the unique cocoa butter glycerides. SRA

SPICES AND CONDIMENTS

Capsicum

1298

Govindarajan (VS) and Sathyanarayana (MN). **Capsicum-production, technology, chemistry and quality. Part V. Impact on physiology, pharmacology, nutrition and metabolism; structure, pungency, pain and desensitization sequences.** *CRC Critical Reviews in Food Science and Nutrition* 29(6): 1991: 435-474

In this the concluding part of the series of reviews, the significant preference of the spice for initially evoking an aversive response, its potent physiological and pharmacological effects, and the aspects of structure activity, relationships of the pungent stimuli of the capsaicinoids are reviewed. The beneficial effects particularly associated with long usage by some ethnic groups and its safe consumption levels, with a critical review of the studies on the gastrointestinal tract, cardiovascular system, the sensory system, thermoregulation, nutritional impacts and an overview of the five series is also detailed. 173 references. SRA

Ginger

1299

Mantri (AR) and Agrawal (YC). **Effect of process variations on dried ginger quality.** *Indian Food Packer* 45(6): 1991: 33-36

Peeled and unpeeled ginger were sliced, pretreated with 2% lime solution and the sensory quality was determined after drying at 65 C. Sensory quality of dried unpeeled ginger was not good. Pretreatment of ginger is not beneficial but slicing before drying is recommended. GS

SENSORY EVALUATION

1300

Race (SW). **Improved product quality through viscosity measurement.** *Food Technology* 45(7): 1991: 86-88

This article answers the questions of how, in general, viscosity is measured: what kind of information it provides; and how the information obtained may be useful. It also takes a look at several practical applications of viscosity measurements of products like orange juice, mayonnaise, ketchup and salad dressing. CSA

1301

Billmeyer (BA) and Wyman (G). **Computerized sensory evaluation system.** *Food Technology* 45(7): 1991: 100-101

The components and working of the pen-based computer technology with graphic design software which eliminates paper ballots and manual data entry while automating sensory data collection and analysis has been discussed. Portability, ease of use and training, flexibility, cost savings, easy and inexpensive maintenance and operational conformity are the various advantages of sensory information system. CSA

1302

Miller (L). **Computerized quality control system.** *Food Technology* 45(7): 1991: 102

This article discusses the quality control system menu options that are available for organizing and compiling quality control information and practical applications of the easy-to-use program. CSA

1303

Lee (WEIII), Barrick (DM) and Welling (ES). **Time-intensity study of prolonged sweet stimuli.** *Journal of Food Science* 57(2): 1992: 524-525, 529

Prolonged intensity and hedonic (like-dislike) temporal responses and any associated adaptive behaviour toward various sweet solutions (sucrose in water) were investigated with specific focus on factors that influenced the transition from 'like" to "dislike". Subjects evaluated the samples using computerized time-intensity (T-I methods to produce sweetness intensity-time and like/dislike-time response curves. The higher concn. solutions resulted in adaptive behaviour. Also, like-to-dislike transition times correlated with sucrose concn., as did other defined paramters which characterized aspects of the responses, several of which displayed significant cross correlations. AS

1304

Reineccius (G). **Off-flavours in foods.** *CRC Critical Reviews in Food Science and Nutrition* 29(6): 1991: 381-402

General description of sensory properties, mechanism of occurrence, and recent research developments for the commonly occurring off-flavours in foods is reviewed. Covers cholorophenols and chloroanisoles, airborne sources of contamination, water-borne sources of contamination, pesticides, disinfectants and detergents, contamination by packaging materials and microbial contamination. 98 references. SRA

1305

Berdague (JL) and Grappin (R). **Sensory characterization of foodstuffs by factorial discriminant analysis: Contribution of translation and scaling of data.** *Lebensmittel-Wissenschaft und - Technologie* 24(4): 1991: 298-302 (Fr)

The aim of this paper is to present the effect of the translation and the scaling of sensory data on the results of a discriminant analysis. However, these classical transformation, often omitted in the analysis of sensory data, can be highly useful for the comparison between different foodstuffs. An example was taken which showed that the translation of data improves the discrimination of judges using the whole or only a part of the notation scale. The scaling of translated data permits the identification of judges showing either a low perception capacity of differences between products or atypical behaviour. These two transformations also result in a significant increase in the discrimination efficiency of the analysis. This increase is estimated by the distance of Manalanobis. AS

FOOD STORAGE

1306

Reichmuth (Chr). **Protection of cereal based food against stored product insect pests using controlled atmospheres.** *Getreide-Mehl und Brot* 44(6): 1990: 166-170 (De)

BIOCHEMISTRY AND NUTRITION

1307

Hernandez (MJM) and Alvarex-Coque (MCG). **Available lysine in protein, assay using o-phthalaldehyde/N-acetyl-L-cysteine spectrophotometric method.** *Journal of Food Science* 57(2): 1992: 503-505

An assay was based on reaction of free ε-amino groups in proteins with the 0-pthalaldehyde/N-acetyl-L-cysteine reagent to form isoindoles, which absorb at 335 nm. The procedure was suitable for proteins or mixtures of proteins with available lysine contents of more than 5 mol. lysine/mol. protein and required absence of free amino acids and peptides. This method was simpler and more convenient than other methods, since it did not require hydrolysis, amino acid analysis, long heating periods or solvent extraction. AS

1308

Bendich (A). **Non-provitamin A activity of carotenoids: Immunoenhancement.** *Trends in Food Science and Technology* 2(5): 1991: 127-130

Carotenoids with or without provitamin A activity have been shown to stimulate the immune responses needed to fight infections and kill tumour cells. Determination of the biological significance of carotenoids must consider factors other than provitamin A activity. Recommended dietary intakes of β-carotene and other carotenoids with provitamin A activity should reflect more than simply their potential conversion to vitamin A. The detn. of dietary requirements should consider the new research that examines the many synthetic effects associated with β-carotene supplementation. There is epidemological evidence that individuals with high carotenoid intakes have a lower risk of developing certain cancers or cataracts. GS

1309

Hitze (W), Brummel (M) and Lersch-Krotoszinski (H). **Investigation of different enzymes (amylogen-cosidase and thermostable amylases) in analysing dietary fibre.** *Getreide-Mehl und Brot* 44(7): 1990: 199-202 (De)

Nutrition

1310

Levy (AS), Fein (SB) and Schucker (RE). **Nutrition labelling formats. Performance and preference.** *Food Technology* 45(7): 1991: 116-121

This article describes a consumer study conducted as one component of Food and Drug Adminstration's information-gathering activities on nutrition labelling formats. The study was a controlled experimental evaluation of five formats namely the control format, control/DRV format, the adjective format, the numeric format and the bar graph format. The experimental design used enables researchers to compare format performance characteristics and expressed preferences for the formats in a realistic label-use situation. The results obtained were objective performance, effects of demographics and health behaviour, accuracy

and false positives by specific nutrients, perceived performance measures and preferences. CSA

1311

Chiesara (E), Marabini (L) and Clementi (F). **Nutritional nephrocalcinosis in rats fed with bovine plasma protein.** *Italian Journal of Food Science* 2(1): 1990: 53-60

Nephrocalcinosis, a lesion which affects the kidney and consists of a deposit of calcium in the tubular lumina, epithelial cells and extracellular space, was induced in rats fed for four months with a diet in which 80% of the protein had been substituted with bovine plasma protein. This protein probably affect one or more steps of the control process of calcium metabolism. This action is supported by other concomitant events, as shown by the fact that nephrocalcinosis occurs principally in female animals and in particular species of animals. AS

TOXICOLOGY

1312

Mukherjee (A) and Giri (AK). **Sister chromatid exchange induced by 'pan masala' (a betel quid ingredient in male mice *in vivo*.** *Food and Chemical Toxicology* 29(6): 1991: 401-403

An aqueous suspension of pan masala injected to mice at doses of 5, 12.5, 25, 100 or 200 mg/kg body wt. showed a significant dose-related increase in sister chromatid exchange. The min. effective dose was 25 mg/kg. The results confirm that pan masala can induce DNA damage and is cytotoxic to bone marrow cells. BV

1313

Beaver (RW). **Decontamination of mycotoxin - containing foods and feedstuffs.** *Trends in Food Science and Technology* 2(7): 1991: 170-173

This article reviews the methods for decontamination of mycotoxin-containing foods and feedstuffs. Method covered are (a) physical methods (belt screening, electronic colour sorting, hand-picking and milling); (b) chemical decontamination using ammonia, calcium hydroxide, ozone, sodium hydroxide and sodium bisulphite; (c) radiation treatment through visible light, ultraviolet light, γ-radiation and electromagnetic radiation; and (d) feed additives (ethoxyquin, BHT, manganese salts and hydrated sodium calcium aluminosilicate) to bind mycotoxins. 36 references. GS

FOOD LAWS AND REGULATIONS

Nil

AUTHOR INDEX

Regd. No. 36729/84

Printed and published by Director, Central Food Technological Research Institute, Mysore 570 013, at CFTRI Printing Press. Editor: Shri K. A. Ranganath, CFTRI, Mysore.